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United States Patent [19]

Williams

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[54] **FLAPPER WHEEL ADAPTER**

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[21] Appl. No.: 603,368

[22] Filed: Feb. 20, 1996

[51] Int. Cl.[6] B24B 41/00

[52] U.S. Cl. 451/342; 451/466; 451/508; 451/509; 451/510; 411/389

[58] Field of Search 457/342, 508, 457/510, 466; 411/389; 451/509

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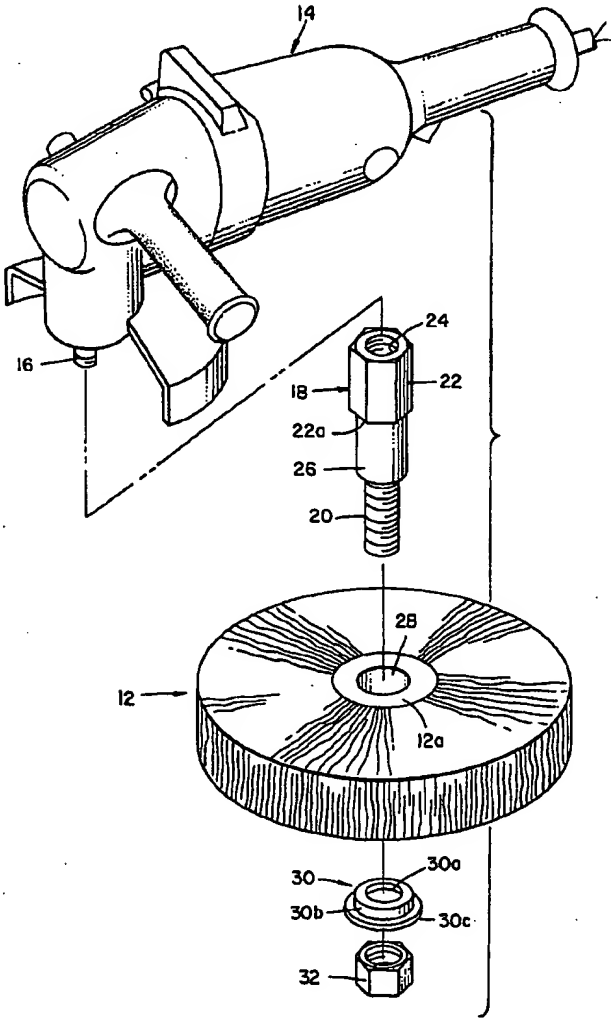
Primary Examiner—Robert A. Rose
Assistant Examiner—George Nguyen
Attorney, Agent, or Firm—James E. Brunton

[57] **ABSTRACT**

An easy-to-use adapter assembly having a minimum number of component parts that will permit sanding flapper wheels of various sizes to be conveniently used in the field with portable hand held electric grinders of conventional design. The assembly is preferably sold as a set that includes connectors of various lengths that can accommodate drive shafts of different sizes so that the assemblage can be conveniently used in connection with flapper wheels of various thickness having spindle receiving apertures of various sizes.

6 Claims, 2 Drawing Sheets



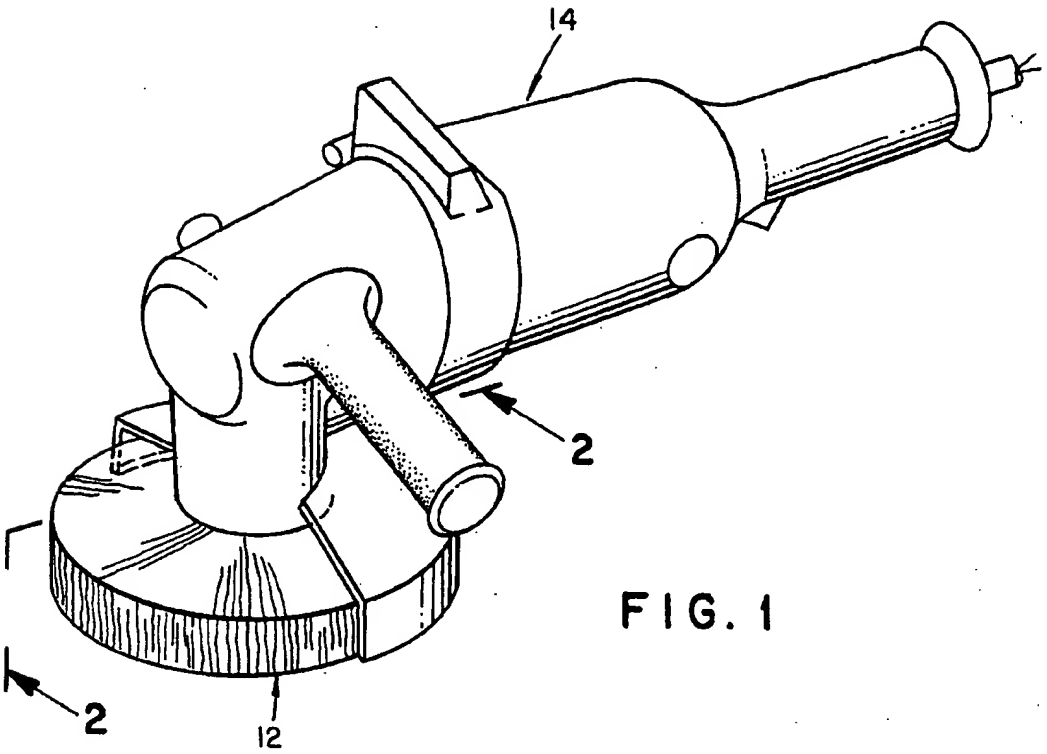


FIG. 1

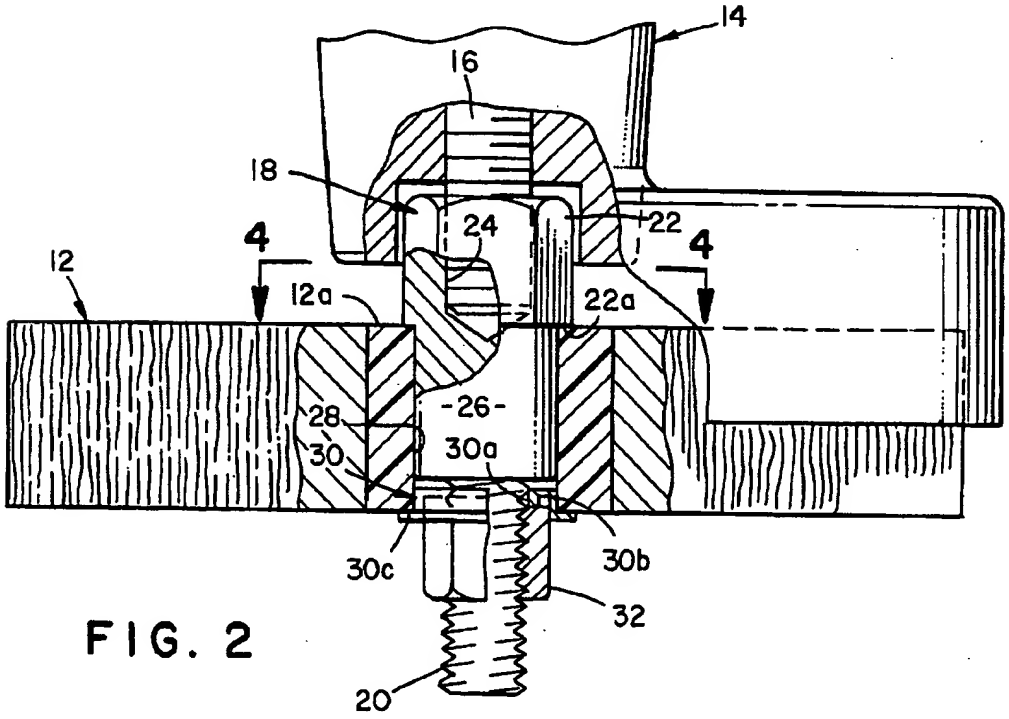


FIG. 2

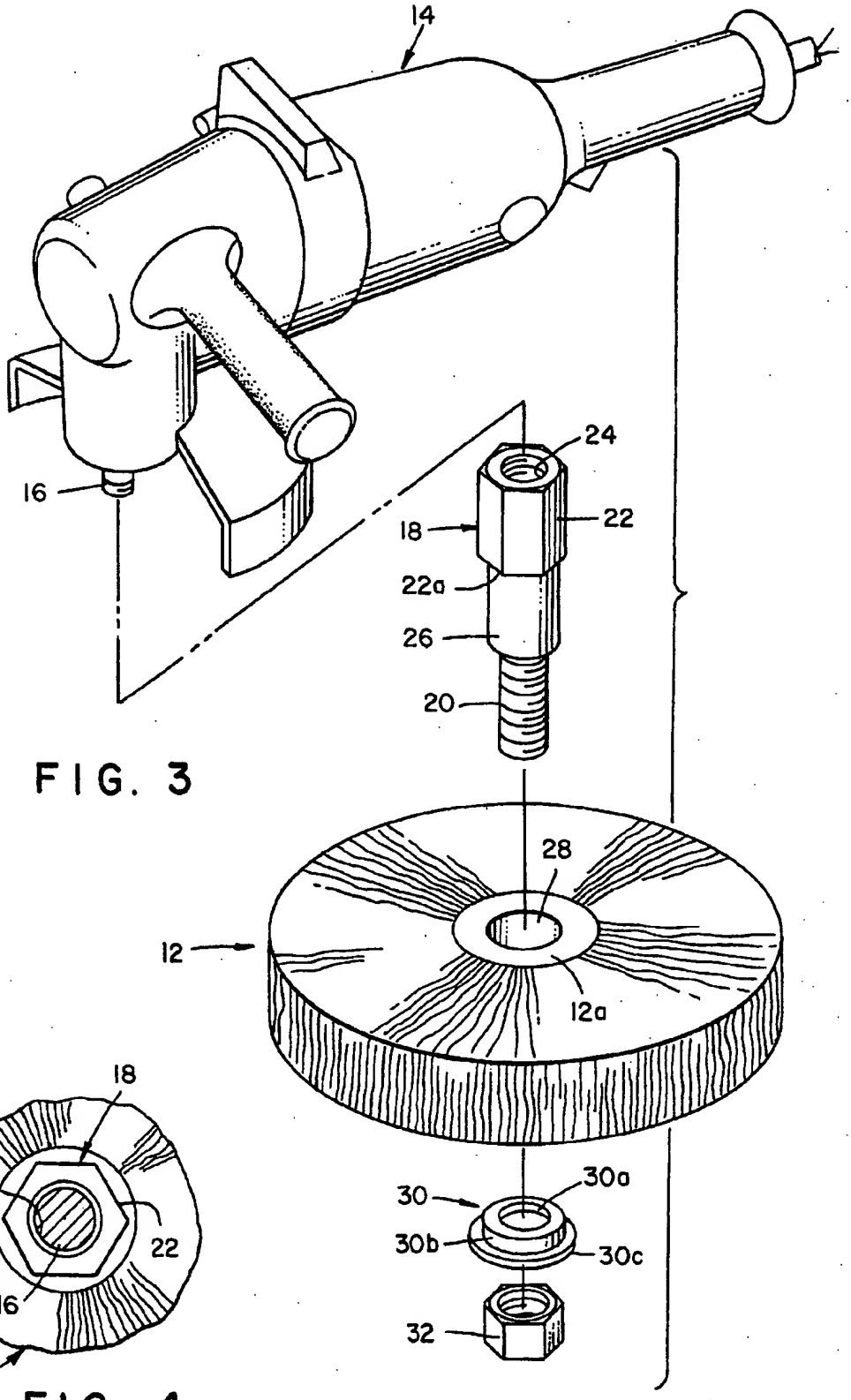


FIG. 3

FIG. 4

FLAPPER WHEEL ADAPTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to adapters for use in connecting work engaging implements to drive shafts of motorized tools. More particularly, the invention concerns an improved adapter assembly for use in removably connecting a sanding flapper wheel to the drive shaft of a hand-held portable grinder.

2. Discussion of the Invention

Sanding flapper wheels of various sizes are typically used on fixedly mounted bench grinders for accomplishing a number of different types of sanding operations in the workshop. These types of sanding wheels could also advantageously be used in the field for accomplishing a number of tasks. However, the drive shafts of easily portable grinder machines, such as portable electric grinders, while able to accept thin sanding discs are typically not able to accept the much thicker sanding flapper wheels. For this reasons the use of the flapper wheels has for the most part been restricted to work which can be accomplished in the machine shop. Because a number of sanding operations can be done in a superior fashion with the flapper wheel rather than the sanding disc, a substantial need has arising for an adapter assembly that can permit interconnection of the standard, relatively wide flapper wheel with the drive shaft of the portable hand-held electric grinder.

U.S. Pat. No. 5,299,391 issued to the present inventor discloses a simple, easy-to-use adapter assembly that permits sander flapper wheels of various sizes to be operably interconnected with standard hand-held grinders. The present invention is an improvement upon the device described in U.S. Pat. No. 5,299,391.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a simple, easy-to-use adapter assembly having a minimum number of component parts that permits sanding flapper wheels of various sizes to be conveniently used in the field with portable hand-held grinders of conventional design.

Another object of the invention is to provide an assembly of the aforementioned character which is easy to use and can be sold as a set that includes connectors of various configurations so that the assemblage can be conveniently used in connection with flapper wheels of various thickness as well as those having spindle receiving apertures of various sizes.

Another object of the invention is to provide an adapter assembly that includes a uniquely configured connector member which includes a head portion, a threaded shaft portion, and an elongated diameter portion which includes a minimum number of parts and is closely receivable within the hub portion of the flapper wheels.

Another object of the invention is to provide an assembly as described in the preceding paragraphs which is durable and reliable in operation, requires the use of only a single compression washer, and one which can be inexpensively manufactured in quantity.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a generally perspective view of a portable, hand-held electric grinding machine to which a commercial type sanding flapper wheel has been interconnected by means of the adapter assembly of the present invention.

FIG. 2 is a greatly enlarged cross-sectional view taken along lines 2—2 of FIG. 1.

FIG. 3 is an enlarged, generally perspective, exploded view of a hand-held portable grinder showing the manner in which the adapter assembly of one form of the invention is used to connect a flapper wheel of standard design to the hand-held grinder.

FIG. 4 is a cross-sectional view taken along lines 4—4 of FIG. 2.

DESCRIPTION OF ONE FORM OF THE INVENTION

Referring to the drawings and particularly to FIGS. 1, 2, 3 and 4, there shown is one form of the adapter assembly of the present invention for use in interconnecting a flapper sanding wheel 12 with a hand held, portable grinder 14 of the character having an externally threaded drive shaft 16 (FIGS. 2 and 3). The adapter assembly of the invention is usable with a number of different types of commercially available grinders including an electric grinder sold by Black & Decker Company and identified by the Serial Number 2750 and a portable electric grinder sold by Jepson Company under the Model Number 4307. Sanding flapper wheels usable with the adapter assembly of the present invention are readily commercially available in various thicknesses having arbor holes of various sizes. For example, such flapper sanding wheels are available from the Merit Company and sold are under Model Numbers 31509, 22551, and 22559.

One form of the adapter assembly of the present invention comprises a connector member 18 having an elongated, externally threaded shaft 20. Connector member 18 is also provided with a generally, hexagonally shaped head portion 22 which has an internally threaded bore 24 of a first diameter. Bore 24 is adapted to threadably receive drive shaft 16 of the portable hand grinder in the manner shown in FIG. 2. As indicated in the drawings, internally threaded bore 24 is co-axially aligned with externally threaded shaft portion 20 of the first member 18. While head portion 22 is preferably integrally formed with shaft 20 it can also comprise a separate unit which can be suitably interconnected in any appropriate manner with shaft 20.

Disposed between head portion 22 and threaded shaft portion 20 is an enlarged diameter, generally cylindrically shaped portion 26. Portion 26 is of a diameter only slightly smaller than the inside diameter of the central bore 28 provided in the particular flapper wheel that is to be used (FIG. 3). The assembly of the embodiment of the invention shown in FIGS. 2 and 3 also includes a compression washer 30 having a central aperture 30*a* adapted to closely receive shaft 20 of the member and is provided with an annular body portion 30*b* , the purpose of which will presently be described. Completing the assembly is a hexagonally shaped, internally threaded nut 32 which is adapted to be threadably interconnected with externally threaded shaft portion 20 of first member 18 in the manner shown in FIG. 2.

As indicated in FIG. 2, when the adapter assembly of the invention is used to mount a flapper wheel 12 to the drive shaft 16 of a hand held grinder, the cylindrical body portion 26 of washer 20 is closely received within the central bore 28 of the flapper wheel to precisely center the flapper wheel relative to the longitudinal axis of connector member 18. With portion 26 of the connector member received within bore 28 of the flapper wheel, the bottom surface 22*a* of hexagonal head portion 22 of the connector engages the

upper surface 12*a* of the flapper wheel proximate the central bore 28 and the threaded portion 20 of the connector extends below the flapper wheel. Threaded portion 20 also extends through the central bore 30*a* of compression washer 30 in the manner shown in FIG. 2. When the compression washer is mated with the flapper wheel, annular body portion 30*b* is closely received within the central bore 28 of the flapper wheel so as to further assist in centering the flapper wheel as nut 32 is tightened against the lower surface 30*c* of socket portion 30*b*.

The adapter assembly of the present invention is preferably sold as a kit containing at least one member 18 having a body portion 26 of a first length of, for example, 7/8th inch and at least one member 18 having a body portion 26 of second length of, for example, 1 7/8th inches. Shafts 20 are typically either 5/8th inch in diameter or 10 millimeters in diameter. For certain applications, the kit may also contain a member 18 having body portion 26 of a length of 1 3/8th inches and a shaft diameter of 3/8th inch.

In using the adapter assembly of the present invention, the diameter of the drive shaft of the particular tool is first determined. This done, an appropriate first member having an internally threaded bore 24 of a size compatible with the drive shaft of the tool is selected. Next, the configuration of the flapper wheel to be used is determined and an appropriate member 18 is selected which has a cylindrical body portion 26 of a diameter slightly less than the inside diameter of the central bore of the flapper wheel and a length slightly less than thickness of the flapper wheel. For example, for a flapper wheel having a thickness of about one inch a member 18 having a body portion with a length of about 7/8th inch is selected. Member 18 is then threadably interconnected with the drive shaft 16 of the portable grinder. Next, the flapper wheel is then inserted over the shaft portion 20 as is the compression washer 30. Finally, the hex nut 32 is interconnected with the outboard end of shaft 20 of member 18 and is snugged down into the socket of the lower compression washer in the manner shown in FIG. 2 so that the flapper wheel is accurately centered and securely clamped in position.

Similarly, for a flapper wheel having a thickness of about 1½ inches, a member 18 having a body portion with a length of not less than 1 3/8th inches is selected and for a flapper wheel having a thickness of about 2 inches a member 18 having a body portion of notless than about 1 7/8th inches is selected. When the flapper wheel is correctly assembly with member 18, enlarged diameter portion 26 of member 18 as well as the outer surface of annular body 30*b* of washer 30 is closely received within the central bore of the flapper wheel. For flapper wheels which have central bores of different diameters, appropriately configured members 18 and washers 30 are selected to insure that a correct assembly is formed wherein the flapper wheel is both precisely centered relative to the shaft of the grinder and is securely connected thereto.

Having now described the invention in detail in accordance with the requirements of the patent statutes, those skilled in this art will have no difficulty in making changes and modifications in the individual parts or their relative assembly in order to meet specific requirements or conditions. Such changes and modifications may be made without departing from the scope and spirit of the invention, as set forth in the following claims.

I claim:

1. An adapter assembly for use in interconnecting a sanding wheel having a central bore and a thickness with a hand-held portable grinder of the character having an externally threaded drive shaft, comprising:

(a) a connector member having:

(i) an externally threaded shaft;

(ii) a head portion spaced apart from said threaded shaft, said head portion having an internally threaded bore of a first diameter which is co-axially aligned with said externally threaded shaft for threadably receiving the drive shaft of the grinder; and

(iii) an elongated body portion disposed intermediate said head portion and said threaded shaft, said elongated body portion being closely receivable within the central bore of the sanding wheel and having a length less than the thickness of the sanding wheel;

(b) a compression washer having a circumferentially extending flange for engaging the sanding wheel and a central aperture for receiving said externally threaded shaft of said first member; and

(c) a nut for threadable engagement with said externally threaded shaft.

2. An assembly as defined in claim 1 further including a second connector member having an externally threaded shaft and a head portion having an internally threaded bore of a second diameter.

3. An assembly as defined in claim 1 in which said elongated body portion of said connector member is generally cylindrical in shape.

4. An assembly as defined in claim 1 in which said head portion of both said connector member is hexagonal in cross-section.

5. An adapter assembly for use in interconnecting flapper sanding wheels of the type normally used with a bench grinder and having first and second widths and first and second central bores with a hand-held portable grinder of the character having an externally threaded drive shaft, comprising:

(a) a first connector member having:

(i) an externally threaded shaft, having a first length;

(ii) an integrally formed, generally hexagonally shaped head having an internally threaded bore of a first diameter co-axially aligned with said shaft for threadably receiving the drive shaft; and

(iii) an elongated body portion disposed intermediate said head portion and said threaded shaft, said elongated body portion having a first length and a first outside diameter;

(b) a second member having:

(i) an externally threaded shaft having a second length;

(ii) an integrally formed, generally hexagonally shaped head portion having an internally threaded bore of a second diameter co-axially aligned with said shaft for threadably receiving the drive shaft; and

(iii) an elongated body portion disposed intermediate said head portion and having a second length and a second outside diameter;

(c) compression washer having a socket portion and a flat surface portion for engaging the sanding wheel and a central aperture for receiving said externally threaded first and second shafts of said first member; and

(d) a nut for threadable engagement with said external threaded first and second shafts.

6. An assembly as defined in claim 5 in which said body portion of said first and second members are closely receivable within the central bores of the flapper sanding wheels.

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United States Patent [19]

Emerson

[11] Patent Number: 5,722,881

[45] Date of Patent: Mar. 3, 1998

[54] **FLAP WHEEL**

[75] Inventor: **Grahame W. Emerson**, Anaheim, Calif.

[73] Assignee: **Merit Abrasive Products, Inc.**, Compton, Calif.

[21] Appl. No.: **706,438**

[22] Filed: **Aug. 30, 1996**

[51] **Int. Cl.**[6] **B24D 13/06**

[52] **U.S. Cl.** **451/466**; 451/464; 451/465

[58] **Field of Search** 451/464, 465, 451/466, 468, 469, 486, 358

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Primary Examiner—Eileen P. Morgan

Attorney, Agent, or Firm—Ellsworth R. Roston; Fulwider Patton Lee & Utecht, LLP

[57] **ABSTRACT**

An abrasive wheel is partially defined by a support member and by a plurality of abrasive flaps on such member. A hole is disposed centrally in the support member to receive a mandrel for rotating the wheel. The support member has at its radial periphery an annular surface with a constant radius at progressive positions in the annular direction. The flaps are fixedly supported (as by epoxy) on the annular surface in a partially overlapping relationship between successive pairs of flaps. Each of the flaps has abrasive particles on one of its surfaces. Each of the flaps is disposed on the annular surface of the support member with the abrasive particles facing outwardly from such support surface. Each of the flaps defines an acute angle with the annular surface and extends at its opposite axial ends beyond the axial positions of support by such support surface. However, the flaps are fixedly positioned relative to one another even at the axial positions beyond the opposite axial ends of the annular surface on the support member as a result of the support by the support member and the overlapping relationship between the flaps in the successive pairs. In this way, the abrasive wheel is able to provide a positive and forceful action on a workpiece surface along the full axial width of the flaps when the abrasive wheel is rotated against the workpiece surface.

25 Claims, 3 Drawing Sheets

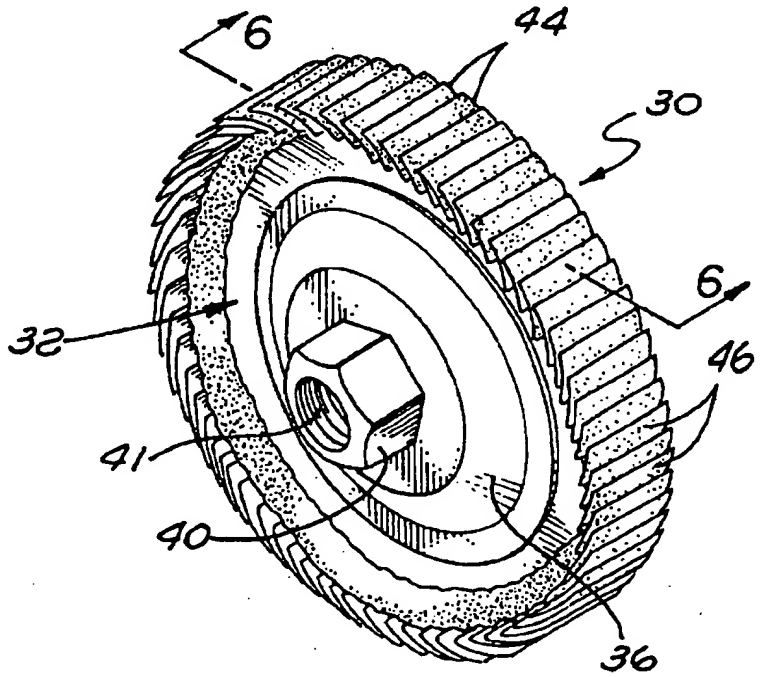
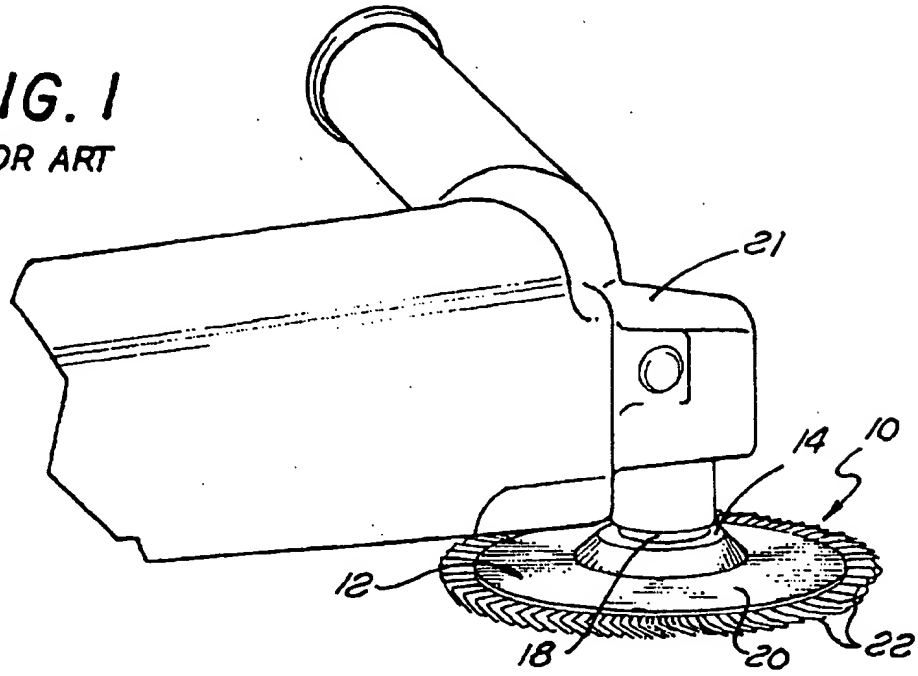


FIG. 1
PRIOR ART



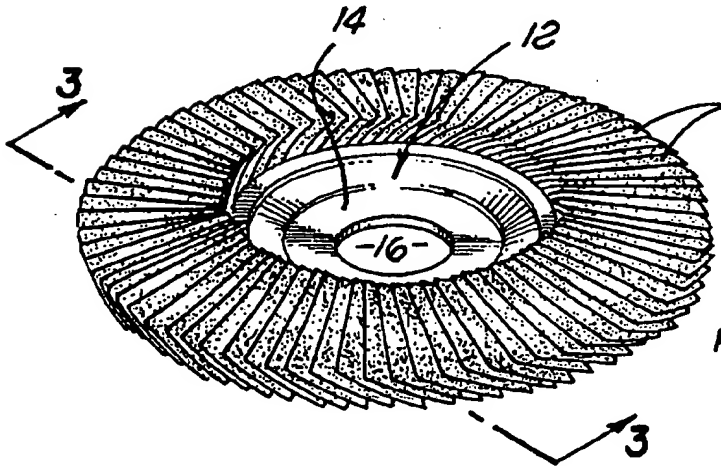
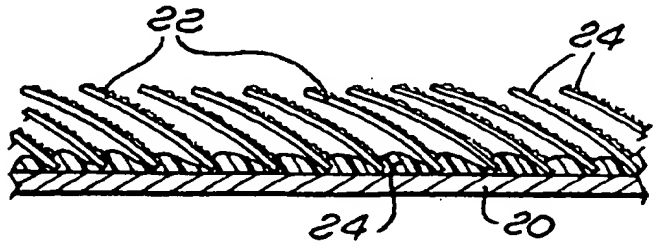


FIG. 2
PRIOR ART

FIG. 3
PRIOR ART



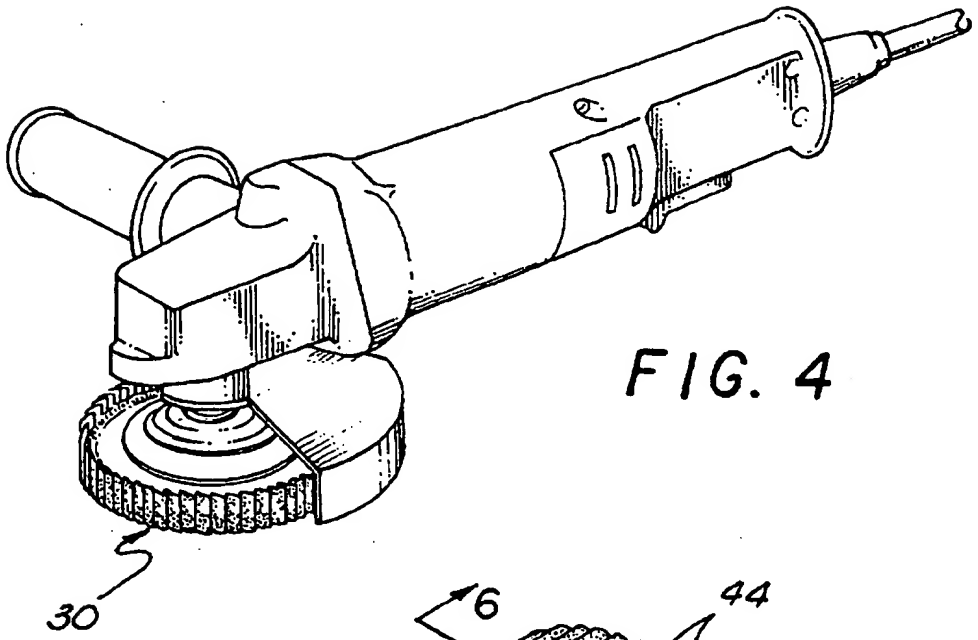


FIG. 4

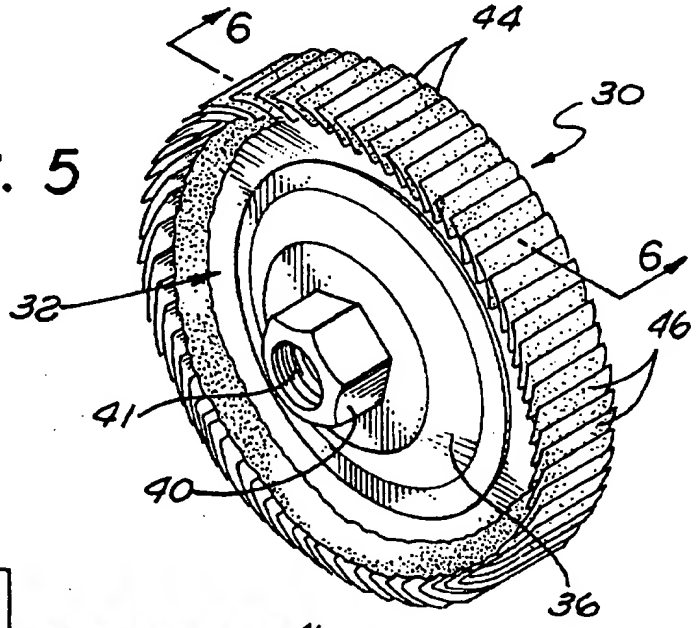


FIG. 5

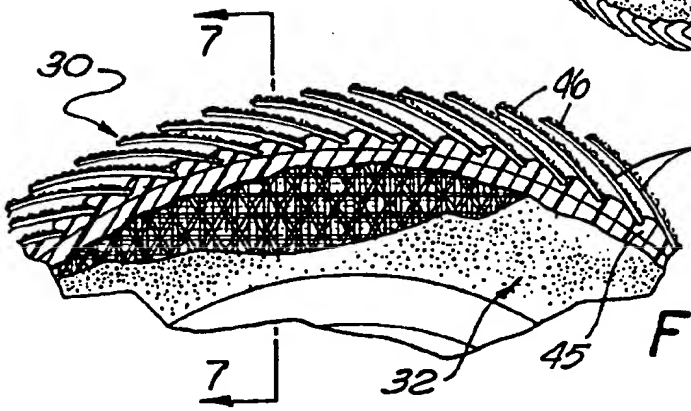


FIG. 6

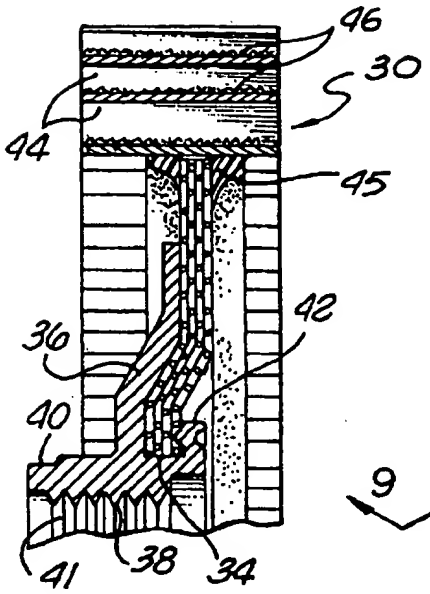


FIG. 7

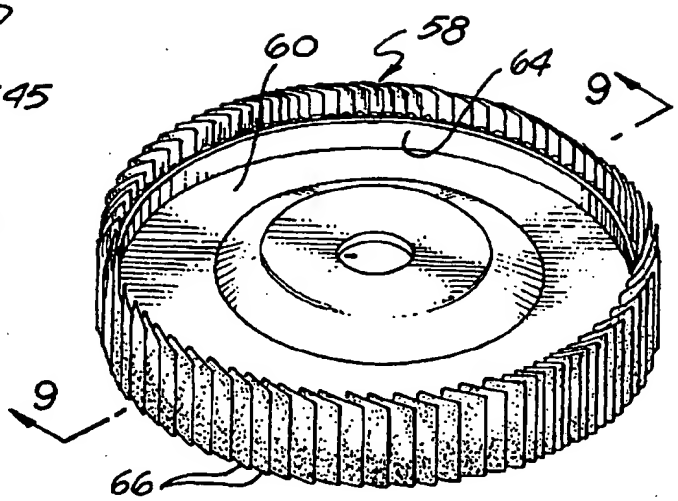


FIG. 8

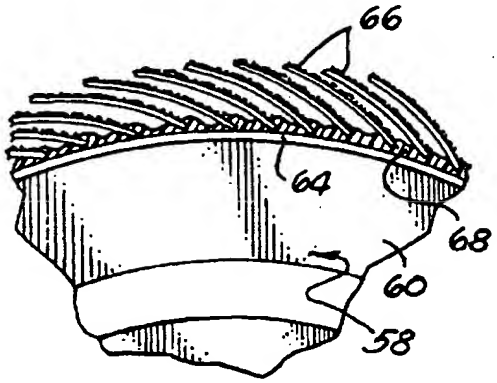


FIG. 10

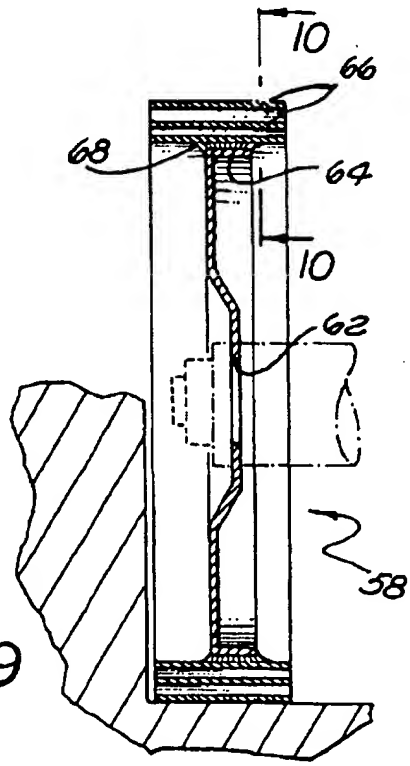


FIG. 9

FLAP WHEEL

This invention relates to an abrasive wheel. More particularly, this invention relates to an abrasive wheel in which a plurality of abrasive flaps are axially disposed on one another in a progressive relationship on the radial periphery of a support member and in which the abrasive flaps extend axially beyond the axial ends of the support member.

BACKGROUND OF THE INVENTION

Abrasive wheels have been known for some time. In one type of abrasive wheel of the prior art, a plurality of abrasive flaps have been provided. Each flap has been coated on one side with abrasive particles. In certain embodiments of the prior art, the abrasive wheel has included a radially disposed disc for supporting the flaps.

In such embodiments of the prior art, the flaps have been attached to one surface of the disc so that each flap is disposed at an acute angle relative to the disc and in partially overlapping relationship to the adjacent flap in the plurality. In this relationship, a peripheral portion of each flap extends in an annular direction beyond the flap on which it is disposed. In this way, the progressive flaps define a complete ring.

When the wheel defined by the support disc and the flaps as discussed above rotates while disposed against a workpiece, the exposed portion of each flap abrades the workpiece. The abrasive wheel is advantageous because it is compact and strong and thus provides for a positive and controlled action on the workpiece.

The abrasive wheel discussed above is disadvantageous because it can be used only in a limited manner to abrade workpieces. This results from the disposition of the abrasive flaps on the disc such that the flaps are disposed in a substantially planar relationship on the disc. This limits the abrasive action of the abrasive wheel against workpiece surfaces which are exposed.

Abrasive wheels have also been known in the prior art where a support member has been provided with an annular surface defined by a constant radius at progressive positions on the surface. Abrasive flaps have been provided on this annular surface to abrade a workpiece surface. However, the abrasive flaps have been loosely disposed relative to one another on this annular surface. This loose relationship has limited the effectiveness of the flaps in abrading the workpiece surface. Furthermore, the axial widths of the flaps in such wheels have been limited to the axial widths of the members for supporting the flaps in such wheels.

BRIEF DESCRIPTION OF THE INVENTION

This invention provides an abrasive wheel which combines the best features of the prior art discussed in the previous paragraphs. The abrasive wheel of this invention is able to abrade surfaces not capable of being abraded by the prior art abrasive discs specified in the previous paragraphs. Furthermore, the abrasive wheel of this invention is able to provide a more positive action on such surfaces than the abrasive wheel discussed in the immediately preceding paragraph. The abrasive wheel of this invention is also advantageous because the flaps in such wheel have a greater axial width than the member supporting such flaps. This allows the abrasive wheel to polish workpiece surfaces not capable of being polished by the abrasive wheels and the abrasive disc of the prior art.

In one embodiment of the invention, an abrasive wheel is partially defined by a support member and by a plurality of abrasive flaps on such member. A hole is disposed centrally in the support member to receive a mandrel for rotating the wheel. The support member has at its radial periphery an annular surface with a constant radius at progressive positions in the annular direction. The flaps are fixedly supported (as by epoxy) on the annular surface in a partially overlapping relationship between successive pairs of flaps.

Each of the flaps has abrasive particles on one of its surfaces. Each of the flaps is disposed on the annular surface of the support member with the abrasive particles facing outwardly from such support surface. Each of the flaps defines an acute angle with the annular surface and extends at its opposite axial ends beyond the axial positions of support by such support surface.

The flaps are fixedly positioned relative to one another in the abrasive wheel of this invention even at the axial positions beyond the opposite axial ends of the annular surface on the support member as a result of the support by the support member and the overlapping relationship between the flaps in the successive pairs. In this way, the abrasive wheel is able to provide a positive and forceful action on a workpiece surface along the full axial width of the flaps when the abrasive wheel is rotated against the workpiece surface.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a schematic perspective view of an abrasive disc of the prior art and of a tool for rotating the abrasive disc with the disc disposed against a workpiece surface;

FIG. 2 is an enlarged perspective view of the abrasive disc shown in FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken substantially on the line 3—3 in FIG. 2 and shows on a schematic basis the interrelationship between successive abrasive flaps on one surface of the disc;

FIG. 4 is a schematic perspective view, similar to that shown in FIG. 1, of an abrasive wheel constituting one embodiment of the invention and a tool for rotating the abrasive wheel with the periphery of the wheel disposed against a workpiece surface;

FIG. 5 is an enlarged perspective view of the embodiment of the abrasive wheel shown in FIG. 4 and shows the abrasive flaps and a member for supporting the flaps;

FIG. 6 is an enlarged fragmentary sectional view taken substantially on the line 6—6 in FIG. 5 and shows the support member and the interrelationship between successive flaps on the annular periphery of the wheel and the support member;

FIG. 7 is an enlarged fragmentary sectional view taken substantially on the line 7—7 of FIG. 6 and shows additional details of the support member and the attachment of the flaps to the support member;

FIG. 8 is a perspective view of an abrasive wheel constituting a second embodiment of the invention and shows a support member and abrasive flaps on the support member;

FIG. 9 is a sectional view taken substantially on the line 9—9 of FIG. 8 and shows additional details of the interrelationship between the support member and the flaps; and

FIG. 10 is an enlarged fragmentary sectional view taken substantially on the line 10—10 of FIG. 9 and shows additional details of the interrelationship between the support member and the flaps.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1-3 illustrate an abrasive wheel, generally indicated at 10, of the prior art. The abrasive wheel 10 includes

a support plate 12 which may preferably be made of a suitable material such as steel and which may be provided with an annular configuration. The support plate 12 may have an indented central portion 14 with a centrally disposed hole 16 for receiving a mandrel 18 for rotating the support plate.

The support plate 12 also includes a portion 20 disposed radially outwardly from the central portion 14. The portion 20 is preferably inclined at a relatively shallow angle from a planar configuration to facilitate the disposition of the abrasive wheel 10 against a workpiece surface (not shown) which is to be polished by the abrasive wheel. A tool 21 rotates the mandrel 18 and the abrasive wheel 10.

A plurality of abrasive flaps 22 are disposed on the portion 20 of the support plate 12. Each of the flaps 22 is formed from a thin strip of a backing material. Abrasive particles 24 are suitably secured to one surface of each of the flaps 22. The flaps 22 are disposed on one another in a partially overlapping relationship and are secured at their inner ends to the portion 20 of the support plate 12 as by a suitable material such as an epoxy 24. Adjacent flaps are substantially parallel to each other in the partially overlapping relationship along substantially the complete length of the flaps.

Because of the partially overlapping relationship, the outer portion of each of the flaps 22 extends outwardly beyond the adjacent flap on which it is disposed. Furthermore, because of this partially overlapping relationship, each of the flaps is disposed at an acute angle relative to the portion 20 of the support member 12. This causes the flaps 22 to have a rigid disposition even when the abrasive wheel 10 is rotated against a workpiece surface to be polished.

The abrasive wheel 10 has certain advantages but also has significant disadvantages. The rigid relationship between the different flaps 22 causes the flaps to be effective in polishing a surface of a workpiece when the portion 20 of the support plate 12 is disposed against the surface. However, the support plate 12 cannot be disposed against all surfaces because of the disposition of the support plate in the form of a disc.

FIGS. 4–7 show an abrasive wheel, generally indicated at 30, constituting one embodiment of the invention. The abrasive wheel 30 includes a support member 32 which may be made from a suitable material such as fibers disposed in two (2) transverse (preferably perpendicular) directions in an interlocking relationship. This interlocking relationship may be defined by each fiber in one direction extending over alternate fibers, and then under the other fibers, in the second (or transverse) direction. Different warp and woof relationships in the fibers may be provided than that specified above without departing from the scope of the invention.

The support member 32 has a central hole 34. A support plate 36 also has a central hole 38. The support plate 36 is disposed on the support member 32 so that the central hole 34 in the support member and the central hole 38 in the support plate are aligned. The support plate 36 includes a protuberance 40 which defines an extension of the hole 38. This extension is internally threaded as at 41 to receive the threads on a mandrel (not shown) for rotating the abrasive wheel 30. The support plate 36 is disposed against one surface of the support member 32 and a flange 42 integral with the support plate is disposed against the other surface of the support member to maintain a fixed relationship between the support member and the support plate.

The support member 32 preferably has a disc-like configuration. A plurality of flaps 44 are attached as by an epoxy 45 to the support member 32 at the outer periphery of the support member. Abrasive particles 46 are suitably attached to one surface of each of the support flaps 44. The flaps 44 are disposed on the support member 32 in a partially overlapping relationship similar to that specified above for the prior art embodiment shown in FIGS. 1–3. In this relationship, the inner ends of the flaps 44 are attached to the support member 32 at the outer radial extremity of the support member and the outer ends of the flaps are exposed so that the abrasive particles 46 face outwardly.

The axial dimension of each of the flaps 44 is preferably greater than the axial width of the support member 32. Preferably the flaps 44 are disposed on the support member 32 so that the flaps 44 extend axially beyond the support member 32 at the opposite axial ends of each of the side surfaces of the support member. For example, when the support member has a diameter of approximately four (4) inches and the support member has a thickness of approximately one quarter of an inch (¼"), the flaps 44 may have an axial dimension of approximately one (1) inch. Preferably the axial extension of the flaps 44 beyond the support member 32 is equal on the opposite sides of the support member.

Each of the flaps 44 may preferably have a length of approximately five eighths of an inch (⅝"). Each flap may overlap the adjacent flap by a distance of approximately three eighths of an inch (⅜") and may extend beyond such adjacent flap by a distance of approximately three sixteenths of an inch (3/16"). In the overlapping relationship, each of the flaps 44 is disposed at an acute angle relative to the annular periphery of the support member 32 at the position at which such flap is attached as by the epoxy 45 to the support surface.

The abrasive wheel 30 has certain important advantages. It is able to polish surfaces not capable of being polished by the abrasive wheels of the prior art. This results from the extension of the abrasive flaps 44 in the axial direction beyond the axial periphery of the support member 32 at the opposite axial ends of the support member.

The effective abrading action of the abrasive wheel 30 shown in FIGS. 4–7 additionally results from the firm and solid relationship between the adjacent flaps 44 around the annulus defined by the flaps even at the axial positions of the flaps beyond the support member 32. Because of this firm and solid relationship, the flaps 44 are able to provide an effective polishing action on the workpiece surface when such workpiece surface is contacted by such flaps.

FIGS. 8–10 show an abrasive wheel, generally indicated at 58, constituting a second embodiment of the invention. In this embodiment, a support plate 60 having a disc-like configuration is provided with a central hole 62 for receiving a mandrel (not shown) and with an annular flange 64 at the radially outward end of the support plate. Flaps 66 corresponding to the flaps 44 (FIGS. 4–7) are attached as by an epoxy 68 to the flange 64 at the inner ends of the flaps. Successive ones of the flaps 66 may have a partially overlapping relationship with respect to the adjacent flap corresponding to the partially overlapping relationship of the flaps 44. The flaps 66 preferably extend axially beyond the flange 64 at the opposite axial ends of the flaps.

The embodiment shown in FIGS. 8–10 has all of the advantages discussed above for the embodiment shown in FIGS. 4–7. In addition, the embodiment shown in FIGS. 8–10 has a simpler construction than the embodiment shown in FIGS. 4–7. This results in part from the replacement of the support member 32 and the support plate 36 in FIGS. 4–7 by

the support plate 60 in FIGS. 8–10. The embodiment shown in FIGS. 7–10 is also advantageous in that the flange 64 on the support plate 60 provides a firm support for the flaps 66.

Although this invention has been disclosed and illustrated with reference to particular embodiments, the principles involved are susceptible for use in numerous other embodiments which will be apparent to persons of ordinary skill in the art. The invention is, therefore, to be limited only as indicated by the scope of the appended claims.

I claim:

1. An abrasive wheel for abrading a surface of a workpiece in accordance with a rotation of the wheel, including,

a substantially rigid rotary member,

first means extending radially from the rotary member and having an annular periphery at its outer radial end and having an annular rim at its outer radial periphery, the annular rim having a width extending axially beyond the first means to define opposite axial ends of the rim,

a plurality of flaps each having an inner end and an outer end and each extending along the width of the rim and each extending from the annular rim at an angle relative to the annular rim and each disposed at least partially on an adjacent one of the flaps in an overlapping relationship in the radial direction with such adjacent ones of the flaps before the rotation of the wheel,

the flaps being disposed around the complete periphery of the annular rim and being substantially parallel to one another in the overlapping relationship along the lengths of the flaps, and

second means for attaching the flaps to the annular rim at the inner ends of the flaps along the width of the rim to retain the flaps in a substantially fixed relationship to one another and to the annular rim, with each flap disposed at the angle relative to the annular rim and with each flap disposed on an adjacent one of the flaps, during the rotation of the abrasive wheel and the application of the wheel against the workpiece surface.

2. An abrasive wheel as set forth in claim 1 wherein

each of the flaps is disposed on the annular rim at an acute angle relative to the annular rim at the position at which it is attached to the annular rim.

3. An abrasive wheel as set forth in claim 1 wherein the flaps extend axially beyond the annular rim at the opposite axial ends of the annular rim and extend at the positions beyond the annular rim in a direction having a component extending radially outwardly from the annular rim.

4. An abrasive wheel as set forth in claim 1 wherein

the second means constitutes an epoxy attached to the inner ends of the abrasive flaps at the position at which the abrasive flaps abut the annular rim.

5. An abrasive wheel as set forth in claim 2 wherein

the periphery of the flaps extends axially beyond the annular rim at the opposite axial ends of the annular rim and wherein

the second means constitutes an epoxy attached to the inner ends of the abrasive flaps at the position at which the abrasive flaps abut the annular rim and wherein

the abrasive flaps extend at the positions beyond the annular rim in a direction having a component extending radially outwardly from the annular rim.

6. An abrasive wheel as set forth in claim 1, including.

the angle between each flap and the annular rim providing for a partially overlapping relationship between each flap and the adjacent flaps.

7. An abrasive wheel for abrading a surface of a workpiece, including.

a substantially rigid member having a looped configuration and having a first portion disposed in a radial plane and having an outer end and having a second portion extending axially from the first portion at the outer end of such radial plane,

a plurality of flaps having inner and outer ends and disposed on one another on the second portion of the member at their inner ends in a partially overlapping relationship to one another in the radial direction at positions between the inner and outer ends of the flaps, the flaps being disposed completely around the looped configuration of the member, adjacent ones of the flaps being disposed in a substantially parallel relationship to each other in the partially overlapping relationship along substantially the complete lengths of the flaps, and

means disposed on the flaps in abutting relationship to the member for retaining the inner ends of the flaps on the second portion of the member in the overlapping relationship during the rotation of the abrasive wheel and the application of the abrasive wheel against the surface of the workpiece.

8. An abrasive wheel as set forth in claim 7 wherein

the first portion of the member has opposite axial ends and wherein

the second portion of the member extends axially beyond the first portion of the member at the opposite axial ends of the first portion of the member and wherein

the flaps extend axially beyond the second portion of the member at the opposite axial ends of the second portion of the member in a direction having a component extending radially outwardly from the annular rim.

9. An abrasive wheel as set forth in claim 7 wherein

the retaining means constitutes an epoxy disposed on the flaps and the second portion of the member at the inner ends of the flaps and disposed relative to the second portion of the member for bonding the inner ends of the flaps to the second portion of the member.

10. An abrasive wheel as set forth in claim 7 wherein

the flaps extend with a directional component radially outwardly from the second portion of the member at an acute angle relative to the second portion of the member in the partially overlapping relationship of the flaps at the positions between the inner and outer ends of the flaps.

11. An abrasive wheel as set forth in claim 8 wherein

the retaining means constitutes an epoxy disposed on the flaps at the inner ends of the flaps and disposed relative to the second portion of the member for bonding the inner ends of the flaps to the second portion of the member and wherein

the flaps extend with a directional component radially outwardly from the second portion of the member at an acute angle relative to the second portion of the member in the partially overlapping relationship of the flaps in the radial direction at the positions between the inner and outer ends of the flaps.

12. An abrasive wheel as set forth in claim 10 wherein

the acute angle between the flaps and the second portion of the member provides a partially overlapping relationship in the radial direction between each flap and at least two (2) of the adjacent flaps in the plurality at the positions between the inner and outer ends of such flaps.

13. An abrasive wheel for abrading a surface of a workpiece in accordance with a rotation of the wheel, including.

a substantially rigid support plate extending in a radial direction and having an outer periphery and having an axially disposed substantially rigid rim at its outer periphery, the rim having an annular configuration,

a plurality of abrasive flaps having inner and outer ends and disposed on one another at their inner ends on the axially disposed rim in a partially overlapping relationship to one another in the radial direction before any rotation of the wheel, adjacent ones of the flaps being disposed in a substantially parallel relationship to each other in the overlapping relationship along substantially the complete lengths of the flaps, and

means for attaching the inner ends of the flaps to the radially disposed rim in the overlapping relationship of the abrasive flaps before any rotation of the wheel,

the flaps being disposed around the complete annular configuration of the rim.

14. An abrasive wheel as set forth in claim **13** wherein

the attaching means is an epoxy and

the support plate is metallic.

15. An abrasive wheel as set forth in claim **13** wherein

the abrasive flaps are disposed at an acute angle relative to the axially disposed rim and wherein the flaps are provided with abrasive particles on one of its surfaces and wherein the surface with the abrasive particles on each of the flaps faces outwardly from the axially disposed rim.

16. An abrasive wheel as set forth in claim **13** wherein

the support plate is provided with a centrally disposed hole to receive a mandrel for rotating the support plate, the abrasive flaps and the attaching means.

17. An abrasive wheel as set forth in claim **13** wherein

the abrasive flaps extend axially beyond the opposite axial ends of the axially disposed rim in a direction having a component extending radially outwardly from the annular rim and wherein the overlapping relationship of the flaps in the radial direction before any rotation of the wheel causes the disposition of the flaps to be rigid even at the axial positions of the flaps beyond the opposite axial ends of the axially disposed rim.

18. An abrasive wheel as set forth in claim **13** wherein

the inner ends of the plurality of the abrasive flaps are disposed on the axially disposed rim to provide an overlapping relationship in the radial direction between each flap and at least two (2) of the flaps contiguous to such flap before any rotation of the wheel.

19. An abrasive wheel as set forth in claim **17** wherein

the attaching means is an epoxy and

the support plate is metallic and wherein

the abrasive flaps are disposed at an acute angle in the radial direction relative to the axially disposed rim and wherein

the flaps are provided with abrasive particles on one of its surfaces and wherein

the surface with the abrasive particles on each of the flaps faces outwardly from the axially disposed rim and wherein

the support plate is provided with a centrally disposed hole to receive a mandrel for rotating the support plate, the abrasive flaps and the attaching means and wherein the plurality of the abrasive flaps are disposed on the axially disposed rim to provide an overlapping relationship in the radial direction between each flap and at least two (2) of the flaps contiguous to such flap before any rotation of the wheel.

20. An abrasive wheel for abrading a surface of a workpiece in accordance with a rotation of the wheel, including,

a radially disposed substantially rigid support plate,

a substantially rigid fibrous member attached to the support plate and extending radially outwardly from the support plate and defining an axially extending substantially rigid rim at the radially outward end of the fibrous member, the rim having a closed configuration

a plurality of abrasive flaps having inner and outer ends and disposed at least partially on one another at their inner ends on the axially extending rim in an overlapping relationship to the adjacent flaps in the plurality before any rotation of the wheel, adjacent ones of the flaps being disposed in a substantially parallel relationship to each other in the overlapping relationship along substantially the complete lengths of the flaps, and

means for attaching the flaps to the axially extending rim at the inner ends of the flaps abutting the rim,

the flaps being disposed completely around the closed configuration of the rim.

21. An abrasive wheel as set forth in claim **20**, including,

the plurality of the abrasive flaps being disposed on the axially extending rim to provide an overlapping relationship in the radial direction between each flap and at least two (2) of the flaps contiguous to such flap before any rotation of the wheel.

22. An abrasive wheel as set forth in claim **20**,

the attaching means constituting first attaching means, and

second means for attaching the fibrous member to the support plate.

23. An abrasive wheel as set forth in claim **22**,

the support plate being made from a metal, and

the first and second attaching means constituting an epoxy.

24. An abrasive wheel as set forth in claim **21**, including,

the attaching means constituting first attaching means, and

second means for attaching the fibrous member to the support plate,

the support plate being made from a metal, and

the first and second attaching means constituting an epoxy.

25. An abrasive wheel as set forth in claim **24**,

the abrasive flaps extending in the axial direction beyond the axial ends of the axially extending rim in a direction having a component extending radially outwardly from the rim and the overlapping relationship between the flaps before any rotation of the wheel providing for a rigid relationship between the flaps even at the axial positions of the flaps beyond the axial ends of the axially extending rims.

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United States Patent [19]

Eisenblätter

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[45] **Date of Patent: Jul. 14, 1987**

[54] **LAMELLAR END GRINDING WHEEL**

[76] Inventor: **Gerd Eisenblätter, Jägerweg 10, 8192 Geretsried 2, Fed. Rep. of Germany**

[21] Appl. No.: **865,973**

[22] Filed: **May 22, 1986**

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[4] **B24D 13/14**

[52] **U.S. Cl.** **51/337**; 51/334; 15/230.16; 15/230.17; 15/230.19

[58] **Field of Search** 51/330, 331, 332, 334, 51/336, 337, 358, 364, 376, 388; 15/230.16, 230.17, 230.19

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Primary Examiner—Robert P. Olszewski

Attorney, Agent, or Firm—Fleit, Jacobson, Cohn & Price

[57] **ABSTRACT**

A back plate for a lamellar end grinding wheel is described, in which grinding flaps overlap one another in tile-like manner along the circumferential zone of a circular disc-like back plate. The arrangement is characterized in that the back plate is constructed as a metal plate, to which is fixed a supporting plate and that the grinding flaps are secured between these two plates.

19 Claims, 9 Drawing Figures

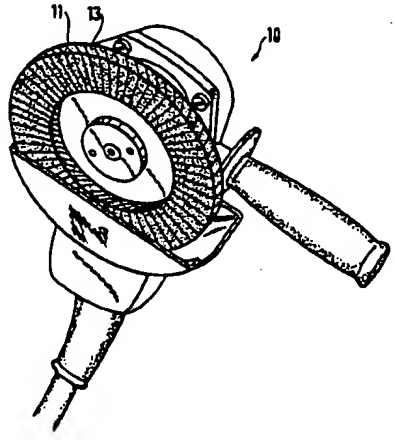


FIG. 1

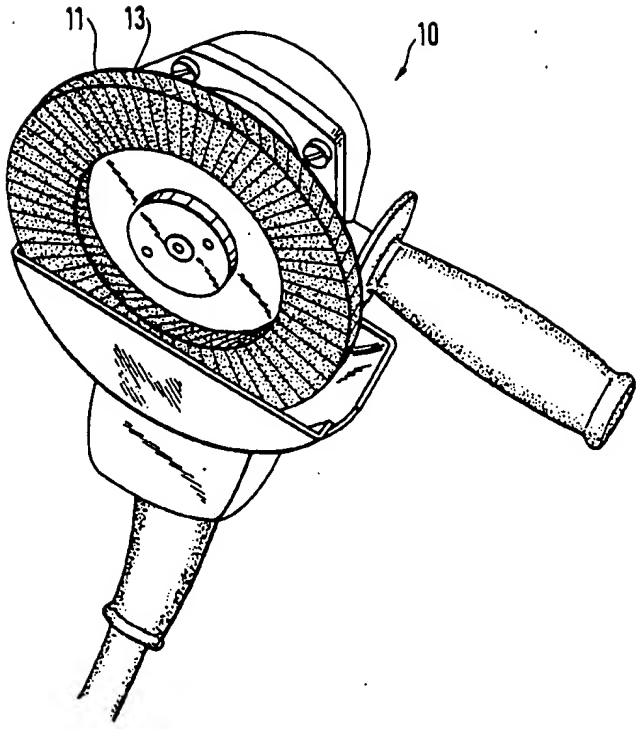


FIG. 2

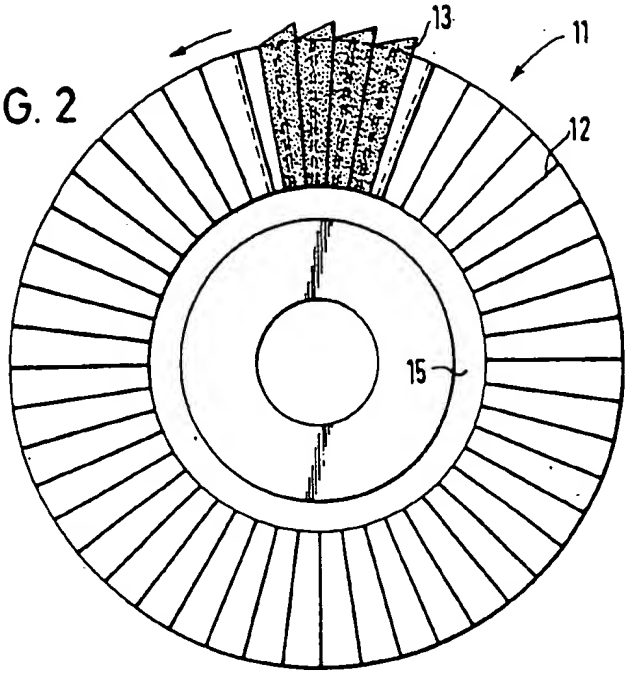


FIG. 3

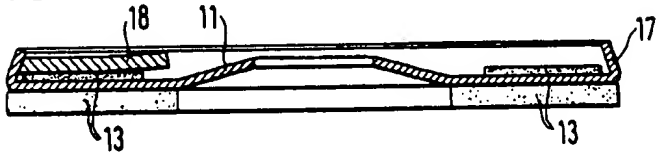


FIG. 4

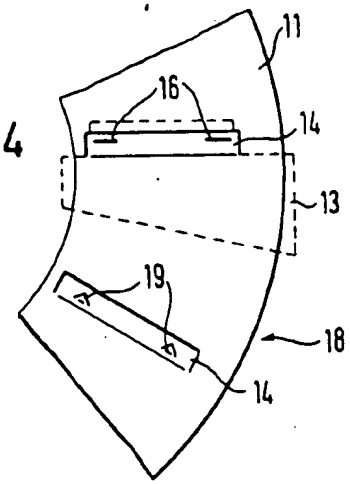


FIG. 5

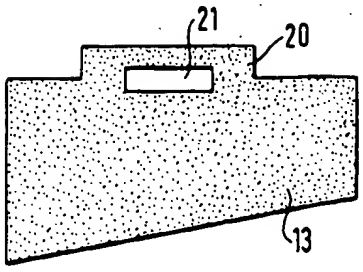


FIG. 6

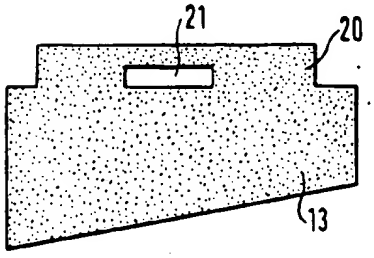


FIG. 7

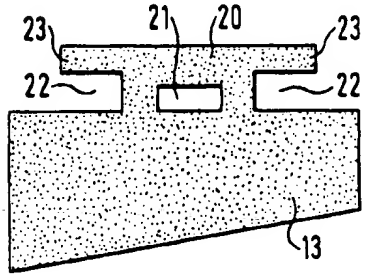


FIG. 8

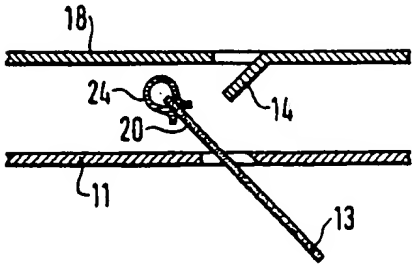
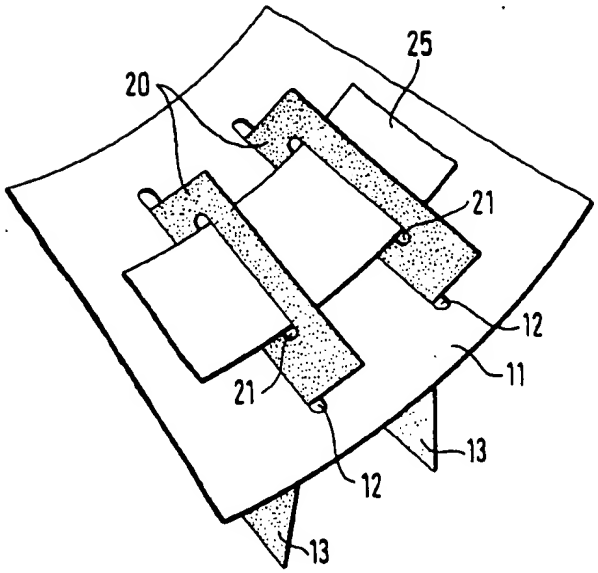


FIG. 9



LAMELLAR END GRINDING WHEEL

BACKGROUND OF THE INVENTION

The invention relates to a lamellar or fan-type end grinding wheel in which abrasive or grinding flaps overlapping one another in tile-like manner and fixed are positioned along the circumferential zone of a circular disc-shaped, flexible base or back plate and project through radial slots in the circumferential zone.

Lamellar end grinding wheels can be used in different ways, but are preferably used in angle grinders. However, such lamellar end grinding wheels can also be used in drilling machines or similar grinding equipment.

A preferred field of use of lamellar end grinding wheels is the smoothing and cleaning of welding seams and spots. In this connection, such lamellar end grinding wheels can also be used for roughing and polishing, without it being necessary to use different wheels or grain sizes. Thus, with the aid of a single tool, it is possible to obtain a particularly good surface quality. However, lamellar end grinding wheels of the present type are also suitable for other operations such as deburring, bevelling, rust removal or removing old paint. It is also possible to work the most varied materials, such as steel, refined steel, nonferrous metals, aluminium, rigid plastics, artificial stone, rocks, wood or fillers.

A lamellar end grinding wheel of the aforementioned type is known from U.S. Pat. No. 3,616,581. This grinding wheel comprises a completely rigid metallic inner wheel or disc with an opening in the centre, around which is concentrically placed a ring with an internal thread for screwing onto a spindle fitted to a grinding tool. The inner wheel is embedded at its edge in a circular ring-shaped outer plastic wheel, which has the radial slots for receiving the grinding flaps. A completely rigid mounting flange is necessary for operating this grinding wheel and is mounted on the tool spindle upstream of the grinding wheel. The grinding wheel equipped with the grinding flaps and partly projecting out of the slots on the workpiece-remote side is subsequently screwed onto the spindle, the circumferential edge of the inner wheel being braced against a rubber-lined, raised edge on the outer circumference of the mounting flange. The intermediate flap portions are fixed in the initial region of the slots. Thus, in the outer region of the grinding wheel the flaps are not fixed.

This lamellar end grinding wheel suffers from the disadvantage that it can only be used with an individually adapted mounting flange and that a locking of the grinding flaps can only take place in conjunction with a grinding tool, whose spindle thread must correspond to the grinding wheel thread. It is also disadvantageous that the grinding flaps are only held at one end, so that the reliability of the fixing is dependent on the care exercised by the operator responsible for fixing the grinding wheel. It is also disadvantageous that the rubber lining of the mounting flange is subject to wear, so that with increasing use the fixing effect decreases. In order to produce the necessary high contact pressure, which is vital for maintaining the grinding flaps over a relatively small pressure surface, the inner wheel and the mounting flange must have a rigid construction, so that the inner region of the grinding wheel must be rigid and does not have the flexibility desired during use. It is also disadvantageous that the operator must take care when mounting a grinding wheel on the mounting flange that the projecting ends of the grinding flaps are uniformly arranged and aligned in the clamping zone to avoid the application of individual flaps, thereby no longer ensuring the clamping of other flaps.

The problem of the present invention is to provide a lamellar end grinding wheel of the aforementioned type, in which the clamping of the grinding flaps takes place directly, i.e. independently of a grinding tool.

SUMMARY OF THE INVENTION

This problem is solved in that the back plate is constructed as a sheet metal disc and that on the side of the back plate remote from the working surface is arranged a supporting plate, that the supporting plate is fixed, at least on the outer circumference to the back plate and that the rear ends of the grinding flaps are fixed between the back plate and the supporting plate.

This leads to a disc or wheel arrangement, which is not only characterized by an extremely high dimensional stability and squeezing stability, but also offers the possibility of having the grinding flaps anchored in a simple and operationally reliable manner by the manufacture by the back plate and the supporting plate being pressed against one another following firm interconnection in the circumferential region.

According to another preferred embodiment of the invention the side of the back plate and/or supporting plate associated with the rear ends of the grinding flaps have projecting punching or stamping points for engaging in the flaps. As a result the grinding flaps are firmly and reliably anchored. This further development of the inventive concept is made particularly operationally reliable by the stamping points being constructed as triangular barbs.

In principle, a single stamping point or a single barb for each grinding flap would suffice to ensure that the particular flap was very durably fixed between the back plate and the supporting plate. It is naturally also possible to provide two barbs per grinding flap, or a plurality of barbs can be formed over the entire plate surface in uniformly distributed manner. If the grinding flaps are inserted in the slot and the supporting plate is pressed onto the back plate, the tips of the barbs are embedded in the material of the pressed home grinding flaps. In operation the forces acting on the grinding flaps always have the tendency to press the inventive barbs more deeply into the flap material. Thus, there is a further improvement to the fixing of the grinding flaps between the two plates.

If during the operation of the inventive lamellar end grinding wheel excessive stressing leads to a movement of the grinding flaps which would lead to the removal thereof from the back plate, the stamping points or barbs press even more firmly into the grinding flap material, which increases the anchoring effect. A particularly simple construction of the barbs for achieving the aforementioned advantages is obtained through their being formed from a triangular sheet metal part, which are cut from the material of the back or supporting plate except for one side on which they are bent out of the plate plane.

It is preferably provided that the supporting plate has radially directed fingers, which slope in the circumferential direction. This measure has the advantage that the individual flaps can be pressed along the entire slot by the spring tension of the fingers. A further advantage is that the fingers can be made in a simple manner, if the supporting plate is provided with radial slots and the

intermediate portions are turned against the supporting plate plane.

The firm connection of the supporting plate and the back plate is preferably achieved in that the circumferential edge of the back plate is bent over towards its side remote from its working surface to form a hook-like circumferential flange in radial section, the supporting plate being fixed under the bent over edge. Thus, the grinding wheel acquires additional rigidity.

The preferred material for the supporting plate is sheet metal, particularly light sheet metal.

An advantageous further development of the lamellar end grinding wheel comprises the rear ends of the grinding flaps being thickened. These thickened portions further help to ensure that the grinding flaps will not slide out of their slots despite the clamping effect during use if particularly high tensile forces occur.

The thickened portion preferably comprises a mounted clip extending substantially over the entire width of the particular grinding flap. These clips can e.g. be fitted by bonding or rivetting to the grinding flap. The clip comprises a slotted, tubular part, which is mounted on the end of the grinding flap and can be fixed by bonding or rivetting.

Alternatively, the thickened portion can be produced in a simple manner in that rivets are fitted along the rear end of the particular grinding flap. A particularly effective and easily manufacturable thickened portion is also obtained by applying an adhesive bead to the grinding flap.

In the case where the supporting plate is provided with fingers, it is preferably provided that the grinding flaps have at least one slot-like recess in their rear regions pass through the slots. This has the advantage that the finger or at least a portion thereof can be passed through, so that the grinding flap is hooked in. The recess can be an opening in the grinding flap and which is surrounded by the material of the latter. Alternatively or additionally thereto, it can be advantageous for the rear regions of the grinding flaps to be provided with projecting arms in which engage the end faces of the slots made in the supporting plate and which extend over and beyond the longitudinal extension of the associated slot. This supports the grinding flap between the back plate and the supporting plate and also hangs the flap in the finger.

It is advantageous to locate a flat, arcuate strip between the back plate and the supporting plate and said strip is passed through the recesses of several juxtaposed grinding flaps. Thus, on said strip are hung several grinding flaps, which are additional secured between the supporting and back plates.

As a result of these measures, the grinding wheel according to the invention can be manufactured with simple means and in a short time. Nevertheless a grinding wheel is obtained representing a complete, independent commercial product, which can be individually mounted on a grinding tool. When reequipping the grinding tool, there is no need for the operator to ensure that he carries out the clamping of the grinding flaps in an operationally reliable manner. The grinding wheel arrangement according to the invention is characterized by being easy to manufacture, operating in a particularly reliable manner and enabling a grinding tool to be reequipped without difficulty.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in greater detail hereinafter relative to non-limitative embodiments and the attached drawings, wherein show:

FIG. 1 A perspective view of an angle grinder with a lamellar end grinding wheel according to the invention.

FIG. 2 A diagrammatic view of a back plate, which is partly equipping with grinding flaps.

FIG. 3 A section through the back plate shown in FIG. 1.

FIG. 4 A diagrammatic partial view of a supporting plate for illustrating the stamping points for fixing the grinding flaps.

FIGS. 5 to 7 Diagrammatic embodiments of the grinding flaps.

FIG. 8 Diagrammatically a cross-section along the circumferential line through a lamellar end grinding wheel.

FIG. 9 A Diagramatic view of an alternative lamellar and grinding wheel.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is a perspective view of an angle grinder 10 equipped with a lamellar end grinding wheel. The grinding wheel is constructed in such a way that grinding flaps 13, superimposed in tile-like or flake-like manner are fitted to a back or base plate 11 made from metal and preferably from an aluminium alloy. The grinding flaps 13 are fixed to the back plate 11 in the manner to be described hereinafter.

Firstly radial slots 12 are made in the outer circumferential area of the basically circular disc-shaped back plate 11, as is diagrammatically illustrated in FIG. 2. This leads to the formation of through-openings, into which can be inserted the rear ends of the grinding flaps 13.

For stiffening purposes and as will be described hereinafter for increasing the contact surface pressure, the back plate 11 can be provided with a reinforcing seam 15, which particularly favourably acts on the dimensional stability of the back plate 11 in the case of a high operating load, i.e. squeezing.

FIG. 3 illustrates in a section through the back plate according to FIG. 1 the grinding flaps 13 in their completely fixed position to the back plate 11. According to FIG. 3, back plate 11 is provided on its outer circumference with a circumferential flange 17, which is bent over in hook-like manner with respect to the main plane of back plate 11. This circumferential flange can e.g. be beaded. According to FIG. 3, the outer circumferential edge of the back plate 11 is bent over by more than 90° in order to form the circumferential flange. The latter gives the back plate 11 an extremely high torsional stiffness, which has a favourable effect on the dimensional stability in operation. The slightly inwardly inverted over edges of the circumferential flange 17 form a circular opening. As the diameter of the circumferential flange 17 increases conically towards the main plane of back plate 11, the space surrounded by circumferential flange 17 increases from the circumferential edge of said flange to the main plane of back plate 11. It is therefore possible to fix a circular ring-like supporting plate 18 behind the circumferential edge of the circumferential flange 17. Such a ring ensures a fixing of the rear flap portions.

The rear region of back plate 11, i.e. the region remote from the grinding flaps 13 is covered by the supporting plate 18. The latter is only purely diagrammatically shown in the left-hand region in FIG. 3. The supporting plate can extend over the entire circular disc surface of the back plate 11, naturally with the exception of the always necessary reception bore. If the supporting plate 18 has a construction and in particular a strength and rigidity corresponding to the corresponding characteristics of back plate 11, an extremely stable and rigid construction is obtained. It is also possible to use supporting plate 18 for bending over and simultaneously fixing the rear ends of the grinding flaps 13.

It is generally sufficient if the supporting plate 18 is firmly connected to the back plate 11 in the outer circumferential region, e.g. by welding, bonding, rivetting or beading. It is also possible to provide additional fixing points on the surface of the two plates, if this should be desired with a view to obtaining greater strength, stability and rigidity.

Both supporting plate 18 and back plate 11 can be made from light metal giving an extremely lightweight and at the same time elastic and very stable construction. This construction of the object of the invention is also largely corrossion-resistant and as a waste product is also very advantageous from the environmental standpoint.

As is diagrammatically shown in FIG. 4, the fixing of the grinding flaps 13 can be further improved in that fingers 14 with stamping points 16 are formed on supporting plate 18. These stamping points 16 can be small protuberances, which are arranged on that side of the fingers 14 facing the grinding flaps 13. If the supporting plate 18 and back plate 11 are compressed for anchoring the grinding flaps, the raised stamping points 16 are embedded in the material of the flaps 13 and consequently form additional anchoring points.

In place of the stamping points 16 illustrated in FIG. 4, e.g. the edges of the fingers 14 could be slightly bent and made sharp-edged in the direction of the grinding flaps 13, so that on pressing together the two disc or wheels the edge regions are embedded into the material of the flaps 13 to such an extent that a reliable anchoring of flaps 13 between back plate 11 and supporting plate 18 is ensured.

The lower region of FIG. 4 illustrates diagrammatically an alternative embodiment of the supporting plate 18. Two barbs 19 are formed on the finger 14 shown at the bottom and on pressing together the back and supporting plates, when the fingers 14 are pressed into the body of the supporting plate 18, their tips are embedded in the material of the grinding flaps 13.

Barbs 19 are produced in such a way that initially an angular slot is made in a finger 14. The region of the finger 14 enclosed by the angular slot is then bent out of the finger plane counter to the direction in which the finger is exhibited opposite to the back plate. A grinding flap 13 can be readily inserted in the slot, without being significantly hindered by the barbs bent out towards the grinding flap. Only when the fingers 14 are firmly pressed onto the grinding flaps 13 do the barbs 19 embed in the material of the flaps and thereby form an extremely reliable fixing of the flaps 13 between back plate 11 and supporting plate 18.

For the easier understanding of FIG. 4, in the example of the upper finger 14, only one grinding flap 13 is indicated in broken line form for illustrating the association of supporting plate 18 and fingers 14 with respect to the grinding flaps. The fingers 14 are bent out of the drawing plane in the direction of the back plate and flaps. They are braced against the grinding flaps 13 and consequently ensure that they cannot be drawn out of the complete grinding wheel.

FIGS. 5, 6 and 7 diagrammatically show an advantageous further development of the grinding flap 13 provided in its rear edge region 20, for insertion in one of the radial slots in the back plate, with a slot-like recess 21 (FIGS. 5 and 6) or with several such recesses 21 (FIG. 7). In the case of a grinding wheel equipped with grinding flaps 13 according to FIG. 5, tongues 16 are placed through the recesses 21 and in this case need not have any stamping or barb. Thus, the grinding flaps 13 are caught by the recesses 21 and prevented from drawing out.

Alternatively, fingers 16 can be longitudinally subdivided into several, not shown finger portions in order to secure the associated grinding flaps 13 in a combination of clamping and back-engaging. Fingers 14 are subdivided into three portions for the use of grinding flaps, e.g. according to FIG. 6. The central finger portion is passed through the recess 21 of the particular grinding flap 13, whilst the two outer finger portions press onto the laterally adjacent flap portions.

FIG. 7 shows in exemplified manner a grinding flap 13 which, apart from the recess 21, has lateral recesses 22, so that projecting flap arms 23 are formed. The end face of the slots provided on the back plate engage in recesses 22. The projecting arms 23 extend over the longitudinal extension of a radial slot in the back plate and by bearing on the latter provide an additional securing effect.

A further alternative of a lamellar end grinding wheel as shown in FIG. 9 comprises arranging a flat, arcuate strip 25 between the back plate and supporting plate and this is passed through the recesses 21 of several juxtaposed grinding flaps 13. FIG. 8 shows a further example of a lamellar end grinding wheel in a purely diagrammatic cross-section along the circumferential line. The rear edge portion 20 of the grinding flaps 13 is provided with a thickened portion which, in the present case is a clip, which substantially extends over the entire width of the grinding flap. This clip can e.g. be fitted by bonding or rivetting to the flap 13. FIG. 8 clearly does not illustrate the final state of the lamellar end grinding wheel when the back plate 11 and supporting plate 18 are firmly interconnected and pressed against one another, leading to the clamping of grinding flap 13. In this state, finger 14 presses against portion 20, the end face of finger 14 being embedded in the material of grinding flap 13.

What is claimed is:

1. Lamellar end grinding wheel comprising

a circular disc-shaped flexible back plate,

grinding flaps arranged along a circumferential zone of said back plate so as to overlap one another in tile-like manner and being fixed there, said grinding flaps being passed through radial slots formed in said circumferential zone, said back plate being constructed as a sheet metal plate,

a supporting plate arranged on the side of said back plate remote from a working surface, said supporting plate being firmly connected to said back plate at least on the outer circumference of said back plate,

rear ends of said grinding flaps being fixed between said back plate and said supporting plate, and

a circumferential edge of said back plate being bent over towards a side remote from said working surface to form a hook-like circumferential flange in radial section and said supporting plate being fixed under said hook-like circumferential flange.

2. Lamellar end grinding wheel according to claim 1, wherein at least one of a side of said back plate and said supporting plate associated with said rear ends of said grinding flaps are provided with projecting stamping points for engaging in said grinding flaps.

3. Lamellar end grinding wheel according to claim 2, wherein said stamping points are constructed as triangular barbs.

4. Lamellar end grinding wheel according to claim 1, wherein said suporting plate has radial fingers, which are arranged in sloping manner in a circumferential direction.

5. Lamellar end grinding wheel according to claim 4, wherein said grinding flaps have at least one slot-like recess in their rear regions which are passed through said radial slots.

6. Lamellar end grinding wheel according to claim 5, wherein said rear region of said grinding flaps is provided with projecting arms, said projecting arms engaging end faces of associated slots and extend over and beyond the longitudinal extension of the associated slot.

7. Lamellar end grinding wheel according to claim 5, wherein a flat, arcuate strip is located between said back plate and said supporting plate and is passed through recesses defined by several juxtaposed grinding flaps.

8. Lamellar end grinding wheel according to claim 1, wherein said supporting plate is made from sheet metal.

9. Lamellar end grinding wheel according to claim 1, wherein each of said rear ends of said grinding flaps is provided with a thickened portion.

10. Lamellar end grinding wheel according to claim 9, wherein said thickened portion comprises a mounted clip extending substantially over the entire width of a particular grinding flap.

11. Lamellar end grinding wheel according to claim 9, wherein said thickened portion is formed by rivets, which are fitted along the rear end of a particular grinding flap.

12. Lamellar end grinding wheel according to claim 9, wherein said thickened portion is formed by an adhesive bead, which is applied to said grinding flaps.

13. Lamellar end grinding wheel comprising

a circular disc-shaped flexible back plate,

grinding flaps arranged along a circumferential zone of said back plate so as to overlap one another in tile-like manner and being fixed there, said grinding flaps being passed through radial slots formed in said circumferential zone,

a supporting plate clamping said grinding flaps on a back side of said back plate, and

a circumferential edge of said back plate bent over towards a side remote from a working surface to form a hook-like circumferential flange in radial section and said supporting plate being fixed under said hook-like circumferential flange.

14. Lamellar end grinding wheel according to claim 13, wherein said supporting plate and said back plate are made from sheet metal.

15. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are welded together.

16. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are connected toward each other by spot welding.

17. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are flanged to each other.

18. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are bonded to each other.

19. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are connected to each other by riveting.

* * * * *

United States Patent [19]

Leistner

[11] **4,302,911**

[45] **Dec. 1, 1981**

[54] **ROTARY FLAP WHEEL TYPE GRINDING TOOL WITH OUTWARDLY FLARING FLAPS**

[75] Inventor: **Güter Leistner, Marienheide, Fed. Rep. of Germany**

[73] Assignee: **Firma August Rüggelberg, Marienheide, Fed. Rep. of Germany**

[21] Appl. No.: **114,299**

[22] Filed: **Jan. 22, 1980**

[30] **Foreign Application Priority Data**

Feb. 13, 1979 [DE] Fed. Rep. of Germany ... 7903893[U]

[51] **Int. Cl.**³ **B24D 13/04**

[52] **U.S. Cl.** **51/334**

[58] **Field of Search** 51/334, 335, 336, 337, 51/401; 15/230.14, 230.16

[56] **References Cited**

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3,699,727	10/1972	McDonald	51/334

FOREIGN PATENT DOCUMENTS

196084	4/1923	United Kingdom	51/334

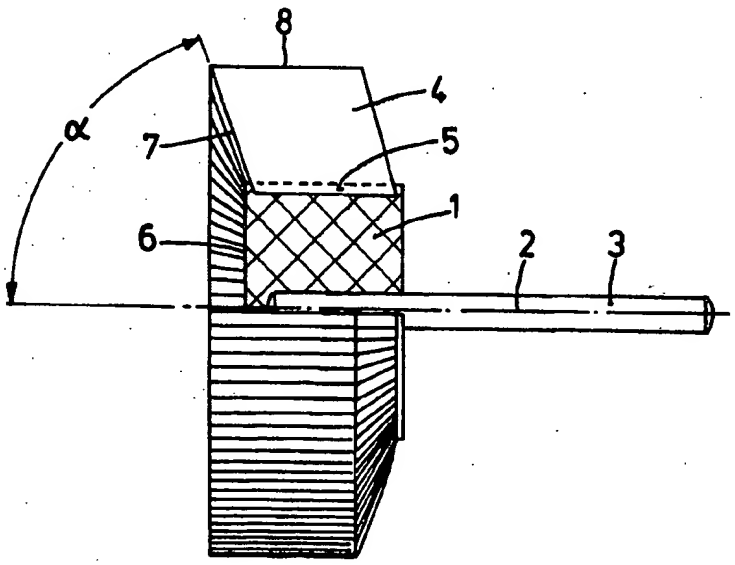
Primary Examiner—Gary L. Smith

Attorney, Agent, or Firm—Browdy and Neimark

[57] **ABSTRACT**

A rotary grinding tool includes a central core constructed concentrically with respect to rotary axis. Lamellae, which are made of support mesh or the like coated with grinding material, are fixed along the total length of their roots to the core and extend approximately in axial planes passing through the rotary axis. The case is provided with a shank or the like for fixing the tool to a rotary grind machine. In order to permit the use of such a grind tool also into the inside angle without impairing its usefulness for peripheral grinding and without additional outlay, the lamallae project steadily increasingly beyond at least one end face of the core with increasing distance from the rotary axis, starting from their respective roots secured in the core.

12 Claims, 2 Drawing Figures



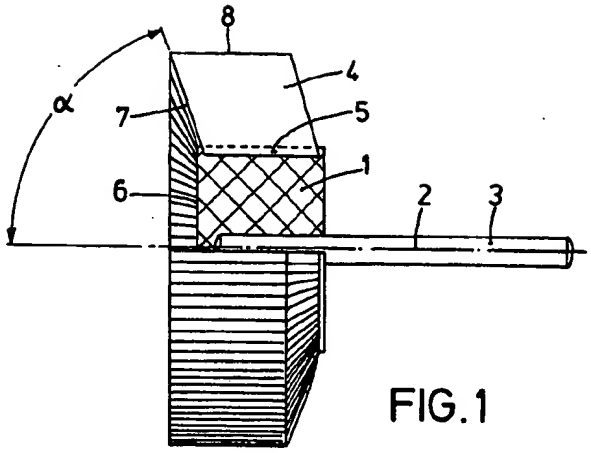


FIG.1

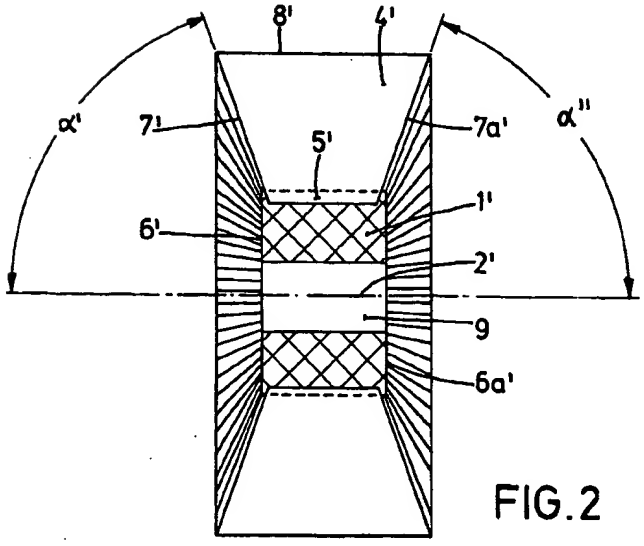


FIG.2

ROTARY FLAP WHEEL TYPE GRINDING TOOL WITH OUTWARDLY FLARING FLAPS

BACKGROUND OF THE INVENTION

This invention relates to a rotary grinding tool which includes lamellae made of support mesh coated with grinding material and secured along the total length of their roots in a central core constructed concentrically to the rotary axis of the tool. The invention relates, more particularly, to such a tool in which the lamellae extend radially outward from the core in axial planes passing through the rotary axis. Devices are provided in or on the core for securing the tool in a rotary grinding machine.

Such rotary grinding tools, which are also designated fan grinders in practice, are used primarily for fine grinding and polishing operations to large radii in tool making and mould making, for machining small surfaces which are difficult to access in tank construction and the manufacture of apparatus, for machining fittings made of heavy and light metals, also stainless and acid-resistant steel. The grinding material, i.e., the abrasive grit, is retained on the support mesh by a plastics binder. In a known arrangement, end-face longitudinal edges of the lamellae directed radially outwards are oriented at right angles to the axis of rotation. The core in which they are embedded projects at the end faces in the axial direction beyond the annular disc-shaped end-face grinding surface constituted by the longitudinal edges of the lamellae. Due to this fact it is impossible to apply these known grinding tools into corners formed between surfaces abutting mutually at right or acute angles which form an inside angle. On the contrary, they can only be used where space is sufficient for free peripheral grinding.

So-called fan grinding pots with a pot-shaped arrangement of the lamellae are also known. In this case the lamellae are embedded oriented radially outwards on an end plate. Grinding tools of this type are useful for end grinding, but only to a restricted degree for peripheral grinding.

SUMMARY OF THE INVENTION

The underlying object of the present invention is to provide a rotary grinding tool which, without impairing its usefulness for peripheral grinding and without additional outlay, also permits its use into the inside angle on work-pieces with surfaces butting together at right angles.

According to the present invention there is provided a rotary grinding tool comprising lamellae made of support mesh coated with grinding material and secured along the total length of their roots in a central core constructed concentrically to the rotary axis of the tool, the lamellae extending radially outwardly from the core in axial planes passing through the rotary axis, and including means in or on the core for securing the tool in a rotary grinding machine, wherein the lamellae project steadily increasingly beyond at least one axial end face of the core with increasing distance starting from the rotary axis from their respective roots fixed in the core.

The lamellae projecting beyond the end face of the core form a grinding surface projecting beyond this end face, which can be brought up even into the inside angle on workpieces, without the end face of the core striking the workpiece beforehand and thus prohibiting a further grinding feed. On the other hand, this grinding tool retains the advantage that each individual lamella is embedded in the core along the total length of its root. The lamellae may have a surface in the shape of a parallelogram or a trapezium so that they can be cut without waste in the same manner as the known rectangular lamellae without additional material outlay. No changes are involved in the remainder of the production cycle for the production of the grinding tools according to the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Two embodiments of the present invention are described, by way of example, with reference to the accompanying drawing, wherein:

FIG. 1 shows a part-sectional view of a grinding tool according to a first embodiment of the present invention with a shank embedded in the core, and

FIG. 2 shows an axial section through a grinding tool according to a second embodiment of the present invention with a continuous bore in the core.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The grinding tool illustrated in FIG. 1 has a cylindrical core 1 made of a castable plastics material, into which there is embedded concentrically to a rotary axis 2 a clamping shank 3 which can be accommodated in a collet or in a chuck of a rotary-driven grinding machine. The core 1 has embedded into its external peripheral region lamellae 4 which have a parallelogram-shaped surface. The lamellae 4 are embedded into the core 1 along the total length of their longitudinal edges parallel and closest to the rotary axis 2—i.e., along the total length of their base or root 5. The lamellae 4 consist of a support mesh on the surface of which grinding material, i.e. an abrasive grit, is applied by means of a plastics binder. The lamellae 4 project steadily increasingly axially outwards beyond the end face 6 of the core 1 which is remote from the clamping shank 3 with increasing radius. The longitudinal edges 7 which limit the lamellae 4 outwards at this point commence flush with the end face. They enclose an angle α with the rotary axis 2 which is preferably between 70° and 85° but may be between 45° and 85°.

The radially outermost edges 8 of the lamellae 4 which limit the external contour extend parallel to the rotary axis 2.

The grinding tool according to FIG. 2 differs from that according to FIG. 1 in that the core 1' is provided with a continuous bore 9 coaxial to the rotary axis 2'. In the bore 9 it is possible in the principle to fix from either side a clamping stud or a shaft so that the grinding tool can be rotated from both sides. The lamellae 4' are fastened in the core 1' in the same manner as in the embodiment according to FIG. 1, and are therefore likewise arranged in planes passing through the rotary axis 2'. The lamellae 4' are, however, in this embodiment trapezoidally shaped, the shorter of the two mutually parallel sides forming the base or root 5' which is embedded in the core 1'. The longer of the two parallel sides forms in each case the external edge 8' which is likewise parallel to the rotary axis 2. From both end faces 6' and 6a', the longitudinal edges 7' and 7a' start, commencing flush, and project steadily and increasingly axially with reference to the associated end face 6' or 6a' with increasing distance from the rotary axis.

In the embodiment according to FIG. 2 the angles α' and α'' which the two longitudinal edges 7' and 7a' enclose with the rotary axis 2' may be mutually different, whereby the scope for use of the tool is further increased. It also lies here again overall within the range from 45° to 85°, preferably in the range from 80° to 85°.

It is to be understood that the preferred embodiments described above and shown in the accompanying drawings have been set out by way of example not by way of limitation. It is to be appreciated that numerous other embodiments and variants are possible without departing from the spirit and scope of the invention, its scope being defined in the appended claims.

What is claimed is:

1. A rotary peripheral grinding tool having a rotary axis, the tool comprising a central core positioned concentrically with respect to said rotary axis; means for peripheral grinding comprising lamellae having respective roots and made of support mesh coated with grinding material secured along the total length of said roots in said central core, and said lamellae extending radially outwardly from said core in axial planes passing through said rotary axis, said lamellae having a cylindrical outer contour, with outer longitudinal edges parallel to said rotary axis for enabling their use as peripheral grinding means in work-pieces having angled areas forming a non-obtuse inside angle, said lamellae further increasingly projecting axially beyond at least one axial end face of said core with increasing distance from said rotary axis starting from said respective roots fixed in said core, and means for securing the tool in a rotary grinding machine.

2. A tool according to claim 1, wherein said lamellae project from said at least one end face starting substantially flush therewith.

3. A tool according to claim 1 or claim 2, wherein said means for securing comprises a clamping shank secured in said core concentrically to said rotary axis and extending from one face thereof for accommodation in a collet or chuck of a grinding machine, said lamellae projecting beyond only that axial end face remote from said clamping shank.

4. A tool according to claim 3, wherein each said lamellae has a parallelogram-shaped surface.

5. A tool according to claim 1 or claim 2, including a bore penetrating said core concentrically with respect to said rotary axis to accommodate a mandrel or a shaft, said lamellae projecting beyond both end faces of said core.

6. A tool according to claim 5, wherein each said lamellae has a trapezoidal surface.

7. A tool according to claim 1 or 2, wherein longitudinal edges of each said lamella respectively projecting from said at least one axial end face enclose an angle from 45° to 85° with respect to said rotary axis.

8. A tool according to claim 7, wherein said means for securing comprises a clamping shank secured in said core concentrically to said rotary axis and extending from one face thereof for accommodation in a collet or chuck of the grinding machine, said lamellae projecting beyond only that axial end face remote form said clamping shank.

9. A tool according to claim 8, wherein each said lamellae has a parallelogram-shaped surface.

10. A tool according to claim 8, including a bore penetrating said core concentrically to rotary axis to accommodate a mandrel or a shaft, said lamellae projecting beyond both end faces of said core.

11. A tool according to claim 10, wherein each said lamellae has a trapezoidal surface.

12. A tool according to claim 7, wherein said angle is from 70° to 85°.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,302,911
DATED : December 1, 1981
INVENTOR(S) : LEISTNER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the title page:

"[75] Inventor: Güter Leistner" should read --[75] Inventor: Günter Leistner--

"[73] Assignee: Firma August Rüggelberg" should read --[73] Firma August Rüggeberg--

Signed and Sealed this

Ninth Day of March 1982

[SEAL]

Attest:

GERALD J. MOSSINGHOFF

Attesting Officer

Commissioner of Patents and Trademarks

United States Patent [19]

Leistner

[11] **4,302,911**

[45] **Dec. 1, 1981**

[54] **ROTARY FLAP WHEEL TYPE GRINDING TOOL WITH OUTWARDLY FLARING FLAPS**

[75] Inventor: **Güter Leistner, Marienheide, Fed. Rep. of Germany**

[73] Assignee: **Firma August Rüggelberg, Marienheide, Fed. Rep. of Germany**

[21] Appl. No.: **114,299**

[22] Filed: **Jan. 22, 1980**

[30] **Foreign Application Priority Data**

Feb. 13, 1979 [DE] Fed. Rep. of Germany ... 7903893[U]

[51] **Int. Cl.**³ **B24D 13/04**

[52] **U.S. Cl.** **51/334**

[58] **Field of Search** 51/334, 335, 336, 337, 51/401; 15/230.14, 230.16

[56] **References Cited**

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196084	4/1923	United Kingdom	51/334

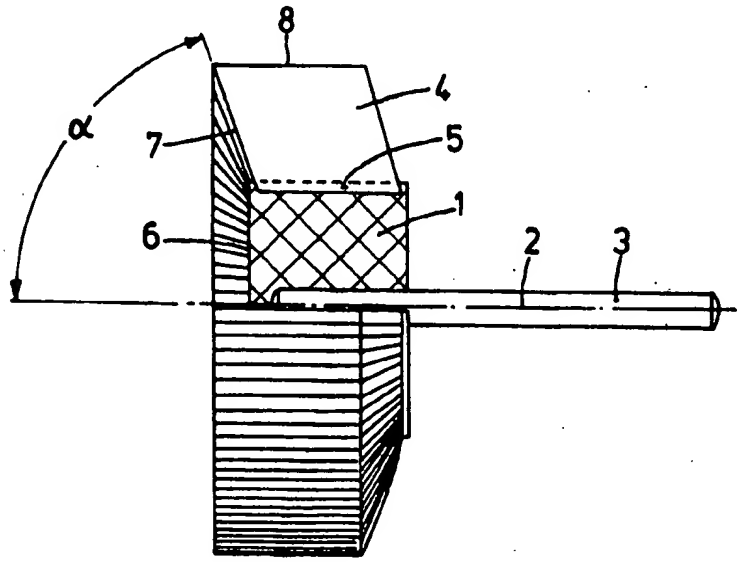
Primary Examiner—Gary L. Smith

Attorney, Agent, or Firm—Browdy and Neimark

[57] **ABSTRACT**

A rotary grinding tool includes a central core constructed concentrically with respect to rotary axis. Lamellae, which are made of support mesh or the like coated with grinding material, are fixed along the total length of their roots to the core and extend approximately in axial planes passing through the rotary axis. The case is provided with a shank or the like for fixing the tool to a rotary grind machine. In order to permit the use of such a grind tool also into the inside angle without impairing its usefulness for peripheral grinding and without additional outlay, the lamallae project steadily increasingly beyond at least one end face of the core with increasing distance from the rotary axis, starting from their respective roots secured in the core.

12 Claims, 2 Drawing Figures



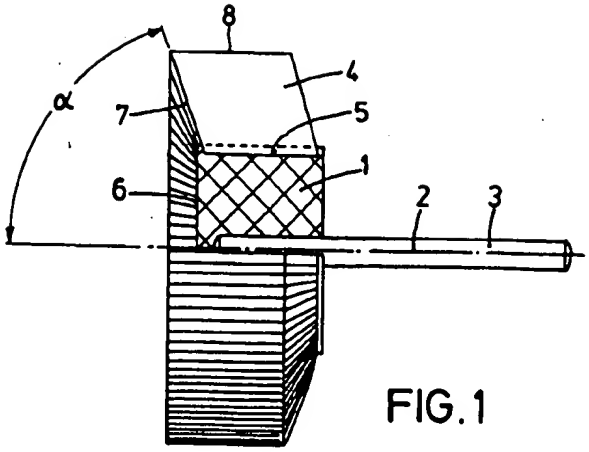


FIG.1

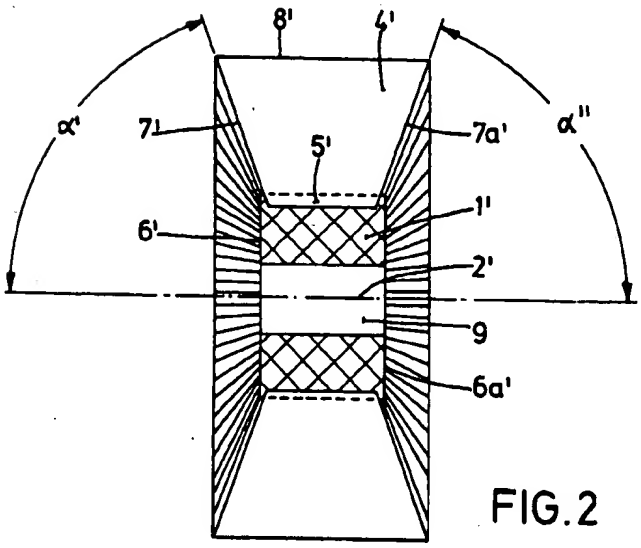


FIG.2

face, which can be brought up even into the inside angle on workpieces, without the end face of the core striking the workpiece beforehand and thus prohibiting a further-

commencing from, and projecting, ingly axially with reference to the associated end face 6' or 6a' with increasing distance from the rotary axis.

06/19/2001, EAST Version: 1.02.0008

In the embodiment according to FIG. 2 the angles α' and α'' which the two longitudinal edges 7' and 7a' enclose with the rotary axis 2' may be mutually different, whereby the scope for use of the tool is further increased. It also lies here again overall within the range from 45° to 85°, preferably in the range from 80° to 85°.

It is to be understood that the preferred embodiments described above and shown in the accompanying drawings have been set out by way of example not by way of limitation. It is to be appreciated that numerous other embodiments and variants are possible without departing from the spirit and scope of the invention, its scope being defined in the appended claims.

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2. A tool according to claim 1, wherein said lamellae project from said at least one end face starting substantially flush therewith.

3. A tool according to claim 1 or claim 2, wherein said means for securing comprises a clamping shank secured in said core concentrically to said rotary axis and extending from one face thereof for accommodation in a collet or chuck of a grinding machine, said lamellae projecting beyond only that axial end face remote from said clamping shank.

4. A tool according to claim 3, wherein each said lamellae has a parallelogram-shaped surface.

5. A tool according to claim 1 or claim 2, including a bore penetrating said core concentrically with respect to said rotary axis to accommodate a mandrel or a shaft, said lamellae projecting beyond both end faces of said core.

6. A tool according to claim 5, wherein each said lamellae has a trapezoidal surface.

7. A tool according to claim 1 or 2, wherein longitudinal edges of each said lamella respectively projecting from said at least one axial end face enclose an angle from 45° to 85° with respect to said rotary axis.

8. A tool according to claim 7, wherein said means for securing comprises a clamping shank secured in said core concentrically to said rotary axis and extending from one face thereof for accommodation in a collet or chuck of the grinding machine, said lamellae projecting beyond only that axial end face remote form said clamping shank.

9. A tool according to claim 8, wherein each said lamellae has a parallelogram-shaped surface.

10. A tool according to claim 8, including a bore penetrating said core concentrically to rotary axis to accommodate a mandrel or a shaft, said lamellae projecting beyond both end faces of said core.

11. A tool according to claim 10, wherein each said lamellae has a trapezoidal surface.

12. A tool according to claim 7, wherein said angle is from 70° to 85°.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

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DATED : December 1, 1981

INVENTOR(S) : LEISTNER

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Signed and Sealed this

Ninth Day of March 1982

[SEAL]

Attest:

GERALD J. MOSSINGHOFF

Attesting Officer *Commissioner of Patents and Trademarks*

US005637033A

United States Patent [19]

Williams

[11] Patent Number: 5,637,033

[45] Date of Patent: Jun. 10, 1997

[54] **FLAPPER WHEEL ADAPTER**

[76] Inventor: Wilson Williams, 1117 W. Carpenter, Jerseyville, Ill. 62052

[21] Appl. No.: 603,368

[22] Filed: Feb. 20, 1996

[51] Int. Cl.[6] B24B 41/00

[52] U.S. Cl. 451/342; 451/466; 451/508; 451/509; 451/510; 411/389

[58] Field of Search 457/342, 508, 457/510, 466; 411/389; 451/509

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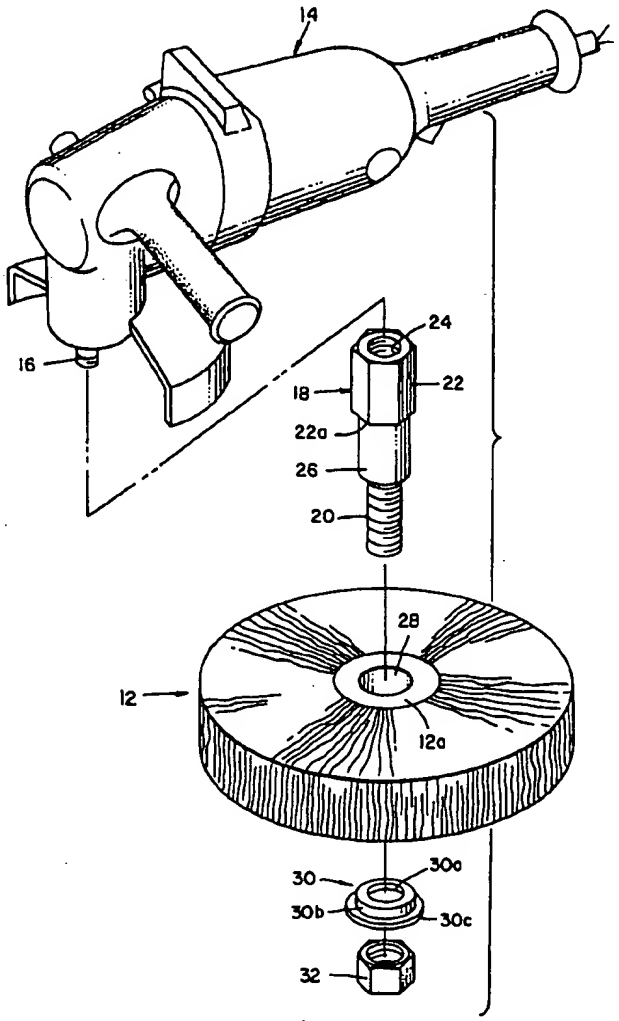
Primary Examiner—Robert A. Rose
Assistant Examiner—George Nguyen
Attorney, Agent, or Firm—James E. Brunton

[57] **ABSTRACT**

An easy-to-use adapter assembly having a minimum number of component parts that will permit sanding flapper wheels of various sizes to be conveniently used in the field with portable hand held electric grinders of conventional design. The assembly is preferably sold as a set that includes connectors of various lengths that can accommodate drive shafts of different sizes so that the assemblage can be conveniently used in connection with flapper wheels of various thickness having spindle receiving apertures of various sizes.

6 Claims, 2 Drawing Sheets



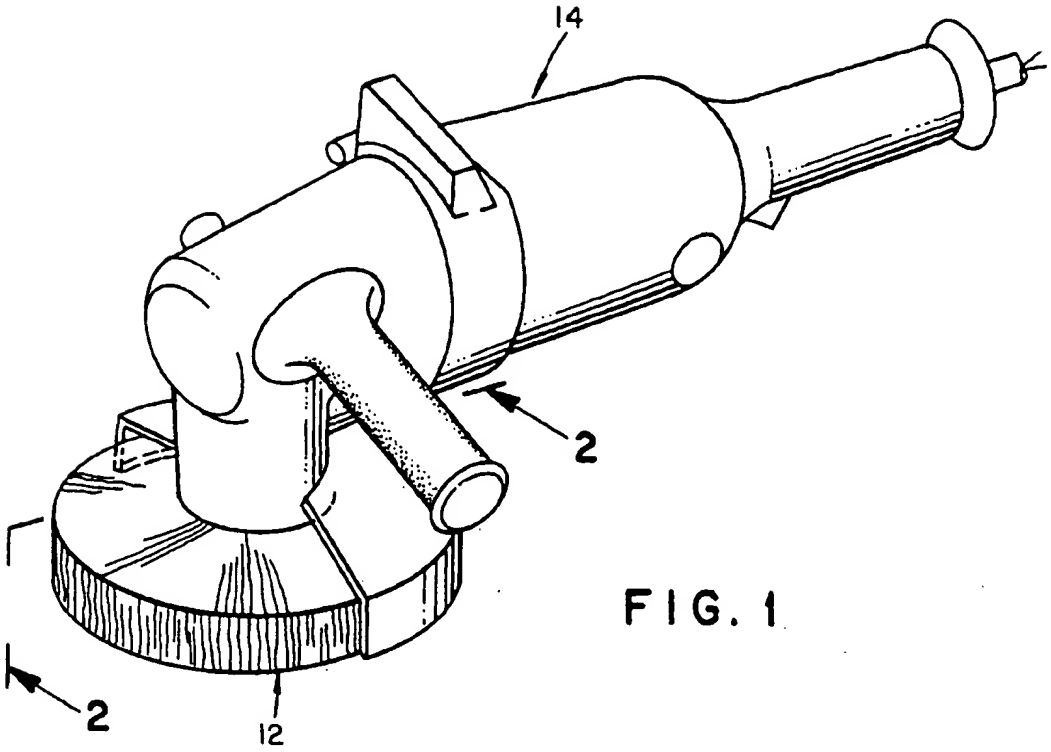


FIG. 1

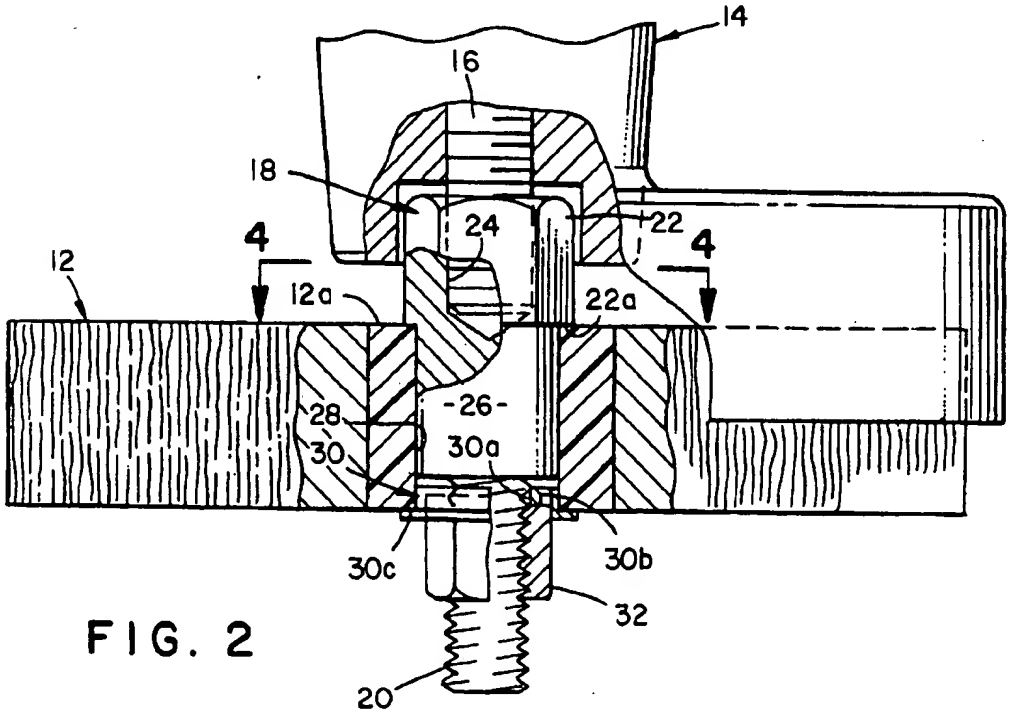


FIG. 2

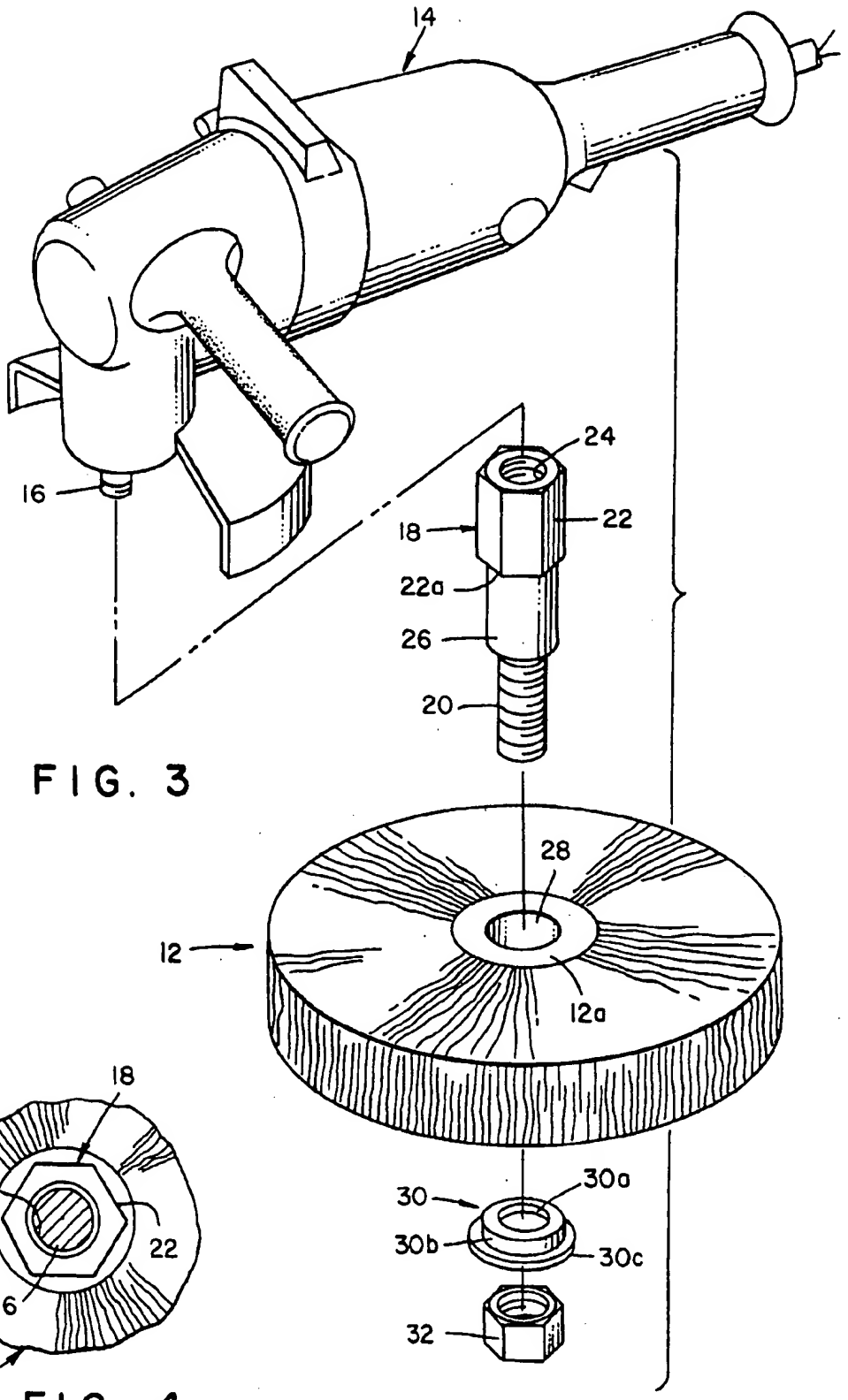


FIG. 3

FIG. 4

FLAPPER WHEEL ADAPTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to adapters for use in connecting work engaging implements to drive shafts of motorized tools. More particularly, the invention concerns an improved adapter assembly for use in removably connecting a sanding flapper wheel to the drive shaft of a hand-held portable grinder.

2. Discussion of the Invention

Sanding flapper wheels of various sizes are typically used on fixedly mounted bench grinders for accomplishing a number of different types of sanding operations in the workshop. These types of sanding wheels could also advantageously be used in the field for accomplishing a number of tasks. However, the drive shafts of easily portable grinder machines, such as portable electric grinders, while able to accept thin sanding discs are typically not able to accept the much thicker sanding flapper wheels. For this reasons the use of the flapper wheels has for the most part been restricted to work which can be accomplished in the machine shop. Because a number of sanding operations can be done in a superior fashion with the flapper wheel rather than the sanding disc, a substantial need has arising for an adapter assembly that can permit interconnection of the standard, relatively wide flapper wheel with the drive shaft of the portable hand-held electric grinder.

U.S. Pat. No. 5,299,391 issued to the present inventor discloses a simple, easy-to-use adapter assembly that permits sander flapper wheels of various sizes to be operably interconnected with standard hand-held grinders. The present invention is an improvement upon the device described in U.S. Pat. No. 5,299,391.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a simple, easy-to-use adapter assembly having a minimum number of component parts that permits sanding flapper wheels of various sizes to be conveniently used in the field with portable hand-held grinders of conventional design.

Another object of the invention is to provide an assembly of the aforementioned character which is easy to use and can be sold as a set that includes connectors of various configurations so that the assemblage can be conveniently used in connection with flapper wheels of various thickness as well as those having spindle receiving apertures of various sizes.

Another object of the invention is to provide an adapter assembly that includes a uniquely configured connector member which includes a head portion, a threaded shaft portion, and an elongated diameter portion which includes a minimum number of parts and is closely receivable within the hub portion of the flapper wheels.

Another object of the invention is to provide an assembly as described in the preceding paragraphs which is durable and reliable in operation, requires the use of only a single compression washer, and one which can be inexpensively manufactured in quantity.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a generally perspective view of a portable, hand-held electric grinding machine to which a commercial type sanding flapper wheel has been interconnected by means of the adapter assembly of the present invention.

FIG. 2 is a greatly enlarged cross-sectional view taken along lines 2—2 of FIG. 1.

FIG. 3 is an enlarged, generally perspective, exploded view of a hand-held portable grinder showing the manner in which the adapter assembly of one form of the invention is used to connect a flapper wheel of standard design to the hand-held grinder.

FIG. 4 is a cross-sectional view taken along lines 4—4 of FIG. 2.

DESCRIPTION OF ONE FORM OF THE INVENTION

Referring to the drawings and particularly to FIGS. 1, 2, 3 and 4, there shown is one form of the adapter assembly of the present invention for use in interconnecting a flapper sanding wheel 12 with a hand held, portable grinder 14 of the character having an externally threaded drive shaft 16 (FIGS. 2 and 3). The adapter assembly of the invention is usable with a number of different types of commercially available grinders including an electric grinder sold by Black & Decker Company and identified by the Serial Number 2750 and a portable electric grinder sold by Jepson Company under the Model Number 4307. Sanding flapper wheels usable with the adapter assembly of the present invention are readily commercially available in various thicknesses having arbor holes of various sizes. For example, such flapper sanding wheels are available from the Merit Company and sold are under Model Numbers 31509, 22551, and 22559.

One form of the adapter assembly of the present invention comprises a connector member 18 having an elongated, externally threaded shaft 20. Connector member 18 is also provided with a generally, hexagonally shaped head portion 22 which has an internally threaded bore 24 of a first diameter. Bore 24 is adapted to threadably receive drive shaft 16 of the portable hand grinder in the manner shown in FIG. 2. As indicated in the drawings, internally threaded bore 24 is co-axially aligned with externally threaded shaft portion 20 of the first member 18. While head portion 22 is preferably integrally formed with shaft 20 it can also comprise a separate unit which can be suitably interconnected in any appropriate manner with shaft 20.

Disposed between head portion 22 and threaded shaft portion 20 is an enlarged diameter, generally cylindrically shaped portion 26. Portion 26 is of a diameter only slightly smaller than the inside diameter of the central bore 28 provided in the particular flapper wheel that is to be used (FIG. 3). The assembly of the embodiment of the invention shown in FIGS. 2 and 3 also includes a compression washer 30 having a central aperture 30*a* adapted to closely receive shaft 20 of the member and is provided with an annular body portion 30*b* , the purpose of which will presently be described. Completing the assembly is a hexagonally shaped, internally threaded nut 32 which is adapted to be threadably interconnected with externally threaded shaft portion 20 of first member 18 in the manner shown in FIG. 2.

As indicated in FIG. 2, when the adapter assembly of the invention is used to mount a flapper wheel 12 to the drive shaft 16 of a hand held grinder, the cylindrical body portion 26 of washer 20 is closely received within the central bore 28 of the flapper wheel to precisely center the flapper wheel relative to the longitudinal axis of connector member 18. With portion 26 of the connector member received within bore 28 of the flapper wheel, the bottom surface 22*a* of hexagonal head portion 22 of the connector engages the

upper surface 12*a* of the flapper wheel proximate the central bore 28 and the threaded portion 20 of the connector extends below the flapper wheel. Threaded portion 20 also extends through the central bore 30*a* of compression washer 30 in the manner shown in FIG. 2. When the compression washer is mated with the flapper wheel, annular body portion 30*b* is closely received within the central bore 28 of the flapper wheel so as to further assist in centering the flapper wheel as nut 32 is tightened against the lower surface 30*c* of socket portion 30*b*.

The adapter assembly of the present invention is preferably sold as a kit containing at least one member 18 having a body portion 26 of a first length of, for example, 7/8th inch and at least one member 18 having a body portion 26 of second length of, for example, 1 7/8th inches. Shafts 20 are typically either 5/8th inch in diameter or 10 millimeters in diameter. For certain applications, the kit may also contain a member 18 having body portion 26 of a length of 1 3/8th inches and a shaft diameter of 3/8th inch.

In using the adapter assembly of the present invention, the diameter of the drive shaft of the particular tool is first determined. This done, an appropriate first member having an internally threaded bore 24 of a size compatible with the drive shaft of the tool is selected. Next, the configuration of the flapper wheel to be used is determined and an appropriate member 18 is selected which has a cylindrical body portion 26 of a diameter slightly less than the inside diameter of the central bore of the flapper wheel and a length slightly less than thickness of the flapper wheel. For example, for a flapper wheel having a thickness of about one inch a member 18 having a body portion with a length of about 7/8th inch is selected. Member 18 is then threadably interconnected with the drive shaft 16 of the portable grinder. Next, the flapper wheel is then inserted over the shaft portion 20 as is the compression washer 30. Finally, the hex nut 32 is interconnected with the outboard end of shaft 20 of member 18 and is snugged down into the socket of the lower compression washer in the manner shown in FIG. 2 so that the flapper wheel is accurately centered and securely clamped in position.

Similarly, for a flapper wheel having a thickness of about 1½ inches, a member 18 having a body portion with a length of not less than 1 3/8th inches is selected and for a flapper wheel having a thickness of about 2 inches a member 18 having a body portion of notless than about 1 7/8th inches is selected. When the flapper wheel is correctly assembly with member 18, enlarged diameter portion 26 of member 18 as well as the outer surface of annular body 30*b* of washer 30 is closely received within the central bore of the flapper wheel. For flapper wheels which have central bores of different diameters, appropriately configured members 18 and washers 30 are selected to insure that a correct assembly is formed wherein the flapper wheel is both precisely centered relative to the shaft of the grinder and is securely connected thereto.

Having now described the invention in detail in accordance with the requirements of the patent statutes, those skilled in this art will have no difficulty in making changes and modifications in the individual parts or their relative assembly in order to meet specific requirements or conditions. Such changes and modifications may be made without departing from the scope and spirit of the invention, as set forth in the following claims.

I claim:

1. An adapter assembly for use in interconnecting a sanding wheel having a central bore and a thickness with a hand-held portable grinder of the character having an externally threaded drive shaft, comprising:

(a) a connector member having:

(i) an externally threaded shaft;

(ii) a head portion spaced apart from said threaded shaft, said head portion having an internally threaded bore of a first diameter which is co-axially aligned with said externally threaded shaft for threadably receiving the drive shaft of the grinder; and

(iii) an elongated body portion disposed intermediate said head portion and said threaded shaft, said elongated body portion being closely receivable within the central bore of the sanding wheel and having a length less than the thickness of the sanding wheel;

(b) a compression washer having a circumferentially extending flange for engaging the sanding wheel and a central aperture for receiving said externally threaded shaft of said first member; and

(c) a nut for threadable engagement with said externally threaded shaft.

2. An assembly as defined in claim 1 further including a second connector member having an externally threaded shaft and a head portion having an internally threaded bore of a second diameter.

3. An assembly as defined in claim 1 in which said elongated body portion of said connector member is generally cylindrical in shape.

4. An assembly as defined in claim 1 in which said head portion of both said connector member is hexagonal in cross-section.

5. An adapter assembly for use in interconnecting flapper sanding wheels of the type normally used with a bench grinder and having first and second widths and first and second central bores with a hand-held portable grinder of the character having an externally threaded drive shaft, comprising:

(a) a first connector member having:

(i) an externally threaded shaft, having a first length;

(ii) an integrally formed, generally hexagonally shaped head having an internally threaded bore of a first diameter co-axially aligned with said shaft for threadably receiving the drive shaft; and

(iii) an elongated body portion disposed intermediate said head portion and said threaded shaft, said elongated body portion having a first length and a first outside diameter;

(b) a second member having:

(i) an externally threaded shaft having a second length;

(ii) an integrally formed, generally hexagonally shaped head portion having an internally threaded bore of a second diameter co-axially aligned with said shaft for threadably receiving the drive shaft; and

(iii) an elongated body portion disposed intermediate said head portion and having a second length and a second outside diameter;

(c) compression washer having a socket portion and a flat surface portion for engaging the sanding wheel and a central aperture for receiving said externally threaded first and second shafts of said first member; and

(d) a nut for threadable engagement with said external threaded first and second shafts.

6. An assembly as defined in claim 5 in which said body portion of said first and second members are closely receivable within the central bores of the flapper sanding wheels.

* * * * *

United States Patent [19]

Eisenblätter

[11] **Patent Number: 4,679,360**

[45] **Date of Patent: Jul. 14, 1987**

[54] **LAMELLAR END GRINDING WHEEL**

[76] Inventor: **Gerd Eisenblätter, Jägerweg 10, 8192 Geretsried 2, Fed. Rep. of Germany**

[21] Appl. No.: **865,973**

[22] Filed: **May 22, 1986**

[30] **Foreign Application Priority Data**

Nov. 22, 1985 [DE] Fed. Rep. of Germany 3541347

[51] **Int. Cl.**[4] **B24D 13/14**

[52] **U.S. Cl.** **51/337**; 51/334; 15/230.16; 15/230.17; 15/230.19

[58] **Field of Search** 51/330, 331, 332, 334, 51/336, 337, 358, 364, 376, 388; 15/230.16, 230.17, 230.19

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Primary Examiner—Robert P. Olszewski

Attorney, Agent, or Firm—Fleit, Jacobson, Cohn & Price

[57] **ABSTRACT**

A back plate for a lamellar end grinding wheel is described, in which grinding flaps overlap one another in tile-like manner along the circumferential zone of a circular disc-like back plate. The arrangement is characterized in that the back plate is constructed as a metal plate, to which is fixed a supporting plate and that the grinding flaps are secured between these two plates.

19 Claims, 9 Drawing Figures

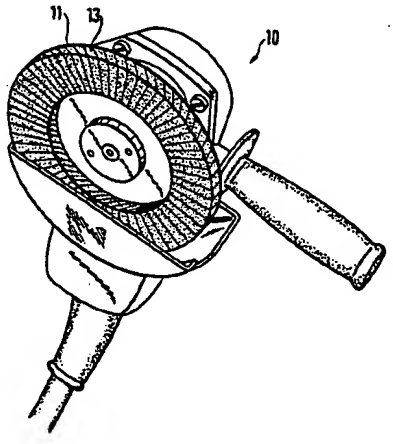


FIG. 1

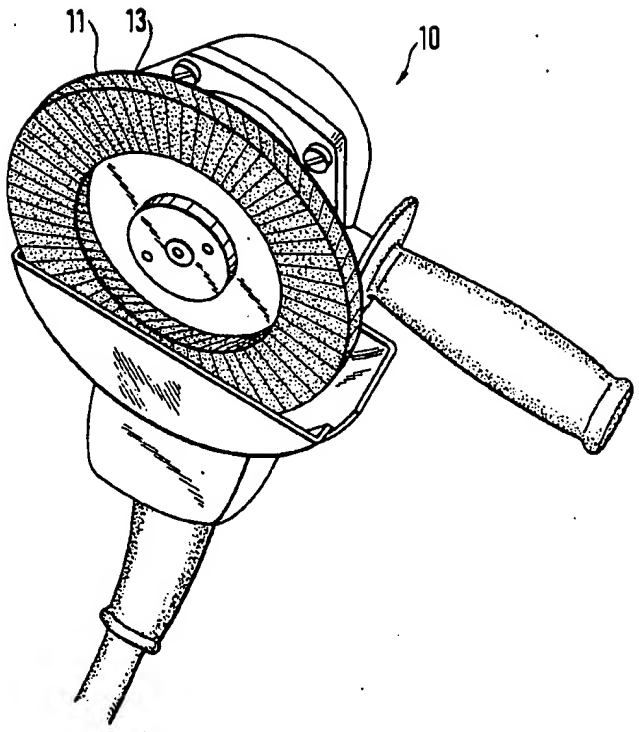
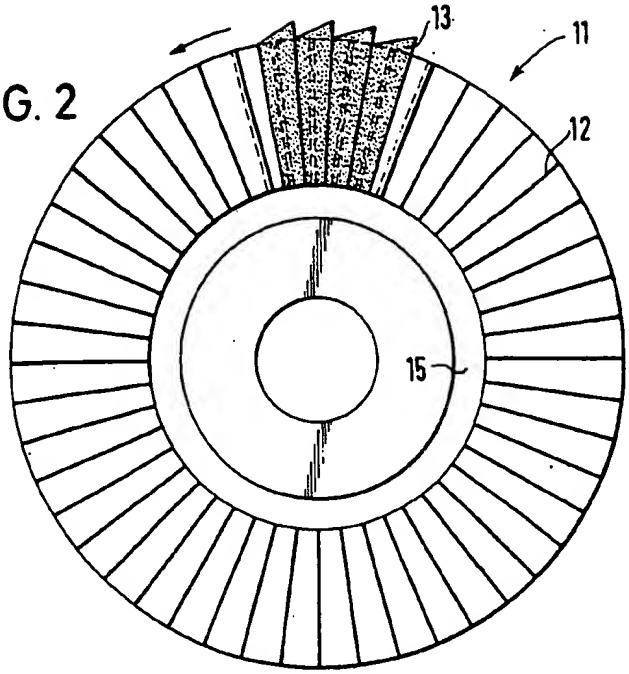


FIG. 2



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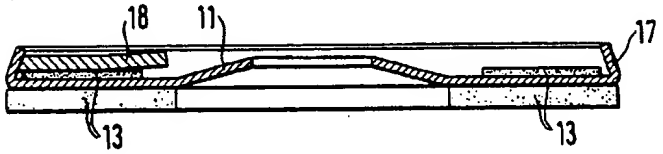


FIG. 4

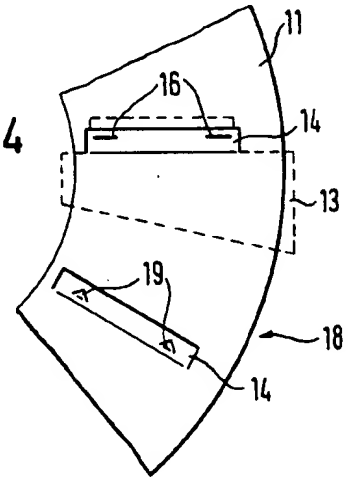


FIG. 5

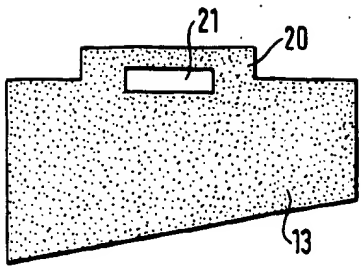


FIG. 6

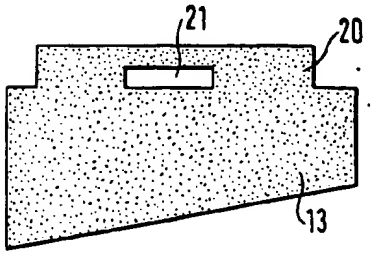


FIG. 7

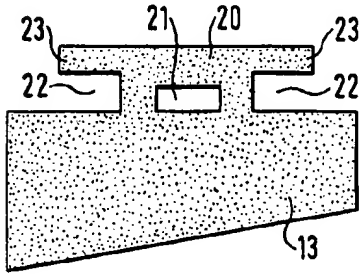


FIG. 8

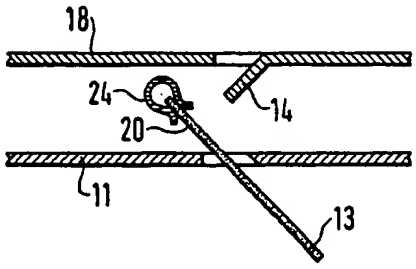
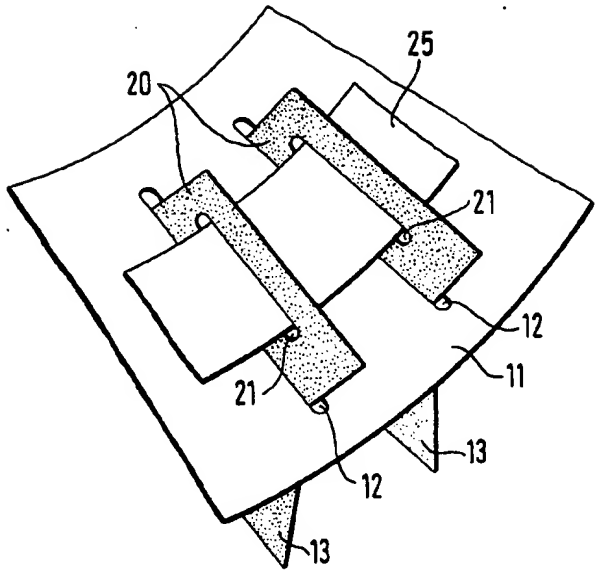


FIG. 9



LAMELLAR END GRINDING WHEEL

BACKGROUND OF THE INVENTION

The invention relates to a lamellar or fan-type end grinding wheel in which abrasive or grinding flaps overlapping one another in tile-like manner and fixed are positioned along the circumferential zone of a circular disc-shaped, flexible base or back plate and project through radial slots in the circumferential zone.

Lamellar end grinding wheels can be used in different ways, but are preferably used in angle grinders. However, such lamellar end grinding wheels can also be used in drilling machines or similar grinding equipment.

A preferred field of use of lamellar end grinding wheels is the smoothing and cleaning of welding seams and spots. In this connection, such lamellar end grinding wheels can also be used for roughing and polishing, without it being necessary to use different wheels or grain sizes. Thus, with the aid of a single tool, it is possible to obtain a particularly good surface quality. However, lamellar end grinding wheels of the present type are also suitable for other operations such as deburring, bevelling, rust removal or removing old paint. It is also possible to work the most varied materials, such as steel, refined steel, nonferrous metals, aluminium, rigid plastics, artificial stone, rocks, wood or fillers.

A lamellar end grinding wheel of the aforementioned type is known from U.S. Pat. No. 3,616,581. This grinding wheel comprises a completely rigid metallic inner wheel or disc with an opening in the centre, around which is concentrically placed a ring with an internal thread for screwing onto a spindle fitted to a grinding tool. The inner wheel is embedded at its edge in a circular ring-shaped outer plastic wheel, which has the radial slots for receiving the grinding flaps. A completely rigid mounting flange is necessary for operating this grinding wheel and is mounted on the tool spindle upstream of the grinding wheel. The grinding wheel equipped with the grinding flaps and partly projecting out of the slots on the workpiece-remote side is subsequently screwed onto the spindle, the circumferential edge of the inner wheel being braced against a rubber-lined, raised edge on the outer circumference of the mounting flange. The intermediate flap portions are fixed in the initial region of the slots. Thus, in the outer region of the grinding wheel the flaps are not fixed.

This lamellar end grinding wheel suffers from the disadvantage that it can only be used with an individually adapted mounting flange and that a locking of the grinding flaps can only take place in conjunction with a grinding tool, whose spindle thread must correspond to the grinding wheel thread. It is also disadvantageous that the grinding flaps are only held at one end, so that the reliability of the fixing is dependent on the care exercised by the operator responsible for fixing the grinding wheel. It is also disadvantageous that the rubber lining of the mounting flange is subject to wear, so that with increasing use the fixing effect decreases. In order to produce the necessary high contact pressure, which is vital for maintaining the grinding flaps over a relatively small pressure surface, the inner wheel and the mounting flange must have a rigid construction, so that the inner region of the grinding wheel must be rigid and does not have the flexibility desired during use. It is also disadvantageous that the operator must take care when mounting a grinding wheel on the mounting flange that the projecting ends of the grinding flaps are uniformly arranged and aligned in the clamping zone to avoid the application of individual flaps, thereby no longer ensuring the clamping of other flaps.

The problem of the present invention is to provide a lamellar end grinding wheel of the aforementioned type, in which the clamping of the grinding flaps takes place directly, i.e. independently of a grinding tool.

SUMMARY OF THE INVENTION

This problem is solved in that the back plate is constructed as a sheet metal disc and that on the side of the back plate remote from the working surface is arranged a supporting plate, that the supporting plate is fixed, at least on the outer circumference to the back plate and that the rear ends of the grinding flaps are fixed between the back plate and the supporting plate.

This leads to a disc or wheel arrangement, which is not only characterized by an extremely high dimensional stability and squeezing stability, but also offers the possibility of having the grinding flaps anchored in a simple and operationally reliable manner by the manufacture by the back plate and the supporting plate being pressed against one another following firm interconnection in the circumferential region.

According to another preferred embodiment of the invention the side of the back plate and/or supporting plate associated with the rear ends of the grinding flaps have projecting punching or stamping points for engaging in the flaps. As a result the grinding flaps are firmly and reliably anchored. This further development of the inventive concept is made particularly operationally reliable by the stamping points being constructed as triangular barbs.

In principle, a single stamping point or a single barb for each grinding flap would suffice to ensure that the particular flap was very durably fixed between the back plate and the supporting plate. It is naturally also possible to provide two barbs per grinding flap, or a plurality of barbs can be formed over the entire plate surface in uniformly distributed manner. If the grinding flaps are inserted in the slot and the supporting plate is pressed onto the back plate, the tips of the barbs are embedded in the material of the pressed home grinding flaps. In operation the forces acting on the grinding flaps always have the tendency to press the inventive barbs more deeply into the flap material. Thus, there is a further improvement to the fixing of the grinding flaps between the two plates.

If during the operation of the inventive lamellar end grinding wheel excessive stressing leads to a movement of the grinding flaps which would lead to the removal thereof from the back plate, the stamping points or barbs press even more firmly into the grinding flap material, which increases the anchoring effect. A particularly simple construction of the barbs for achieving the aforementioned advantages is obtained through their being formed from a triangular sheet metal part, which are cut from the material of the back or supporting plate except for one side on which they are bent out of the plate plane.

It is preferably provided that the supporting plate has radially directed fingers, which slope in the circumferential direction. This measure has the advantage that the individual flaps can be pressed along the entire slot by the spring tension of the fingers. A further advantage is that the fingers can be made in a simple manner, if the supporting plate is provided with radial slots and the

intermediate portions are turned against the supporting plate plane.

The firm connection of the supporting plate and the back plate is preferably achieved in that the circumferential edge of the back plate is bent over towards its side remote from its working surface to form a hook-like circumferential flange in radial section, the supporting plate being fixed under the bent over edge. Thus, the grinding wheel acquires additional rigidity.

The preferred material for the supporting plate is sheet metal, particularly light sheet metal.

An advantageous further development of the lamellar end grinding wheel comprises the rear ends of the grinding flaps being thickened. These thickened portions further help to ensure that the grinding flaps will not slide out of their slots despite the clamping effect during use if particularly high tensile forces occur.

The thickened portion preferably comprises a mounted clip extending substantially over the entire width of the particular grinding flap. These clips can e.g. be fitted by bonding or rivetting to the grinding flap. The clip comprises a slotted, tubular part, which is mounted on the end of the grinding flap and can be fixed by bonding or rivetting.

Alternatively, the thickened portion can be produced in a simple manner in that rivets are fitted along the rear end of the particular grinding flap. A particularly effective and easily manufacturable thickened portion is also obtained by applying an adhesive bead to the grinding flap.

In the case where the supporting plate is provided with fingers, it is preferably provided that the grinding flaps have at least one slot-like recess in their rear regions pass through the slots. This has the advantage that the finger or at least a portion thereof can be passed through, so that the grinding flap is hooked in. The recess can be an opening in the grinding flap and which is surrounded by the material of the latter. Alternatively or additionally thereto, it can be advantageous for the rear regions of the grinding flaps to be provided with projecting arms in which engage the end faces of the slots made in the supporting plate and which extend over and beyond the longitudinal extension of the associated slot. This supports the grinding flap between the back plate and the supporting plate and also hangs the flap in the finger.

It is advantageous to locate a flat, arcuate strip between the back plate and the supporting plate and said strip is passed through the recesses of several juxtaposed grinding flaps. Thus, on said strip are hung several grinding flaps, which are additional secured between the supporting and back plates.

As a result of these measures, the grinding wheel according to the invention can be manufactured with simple means and in a short time. Nevertheless a grinding wheel is obtained representing a complete, independent commercial product, which can be individually mounted on a grinding tool. When reequipping the grinding tool, there is no need for the operator to ensure that he carries out the clamping of the grinding flaps in an operationally reliable manner. The grinding wheel arrangement according to the invention is characterized by being easy to manufacture, operating in a particularly reliable manner and enabling a grinding tool to be reequipped without difficulty.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in greater detail hereinafter relative to non-limitative embodiments and the attached drawings, wherein show:

FIG. 1 A perspective view of an angle grinder with a lamellar end grinding wheel according to the invention.

FIG. 2 A diagrammatic view of a back plate, which is partly equipping with grinding flaps.

FIG. 3 A section through the back plate shown in FIG. 1.

FIG. 4 A diagrammatic partial view of a supporting plate for illustrating the stamping points for fixing the grinding flaps.

FIGS. 5 to 7 Diagrammatic embodiments of the grinding flaps.

FIG. 8 Diagrammatically a cross-section along the circumferential line through a lamellar end grinding wheel.

FIG. 9 A Diagramatic view of an alternative lamellar and grinding wheel.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is a perspective view of an angle grinder **10** equipped with a lamellar end grinding wheel. The grinding wheel is constructed in such a way that grinding flaps **13**, superimposed in tile-like or flake-like manner are fitted to a back or base plate **11** made from metal and preferably from an aluminium alloy. The grinding flaps **13** are fixed to the back plate **11** in the manner to be described hereinafter.

Firstly radial slots **12** are made in the outer circumferential area of the basically circular disc-shaped back plate **11**, as is diagrammatically illustrated in FIG. **2**. This leads to the formation of through-openings, into which can be inserted the rear ends of the grinding flaps **13**.

For stiffening purposes and as will be described hereinafter for increasing the contact surface pressure, the back plate **11** can be provided with a reinforcing seam **15**, which particularly favourably acts on the dimensional stability of the back plate **11** in the case of a high operating load, i.e. squeezing.

FIG. **3** illustrates in a section through the back plate according to FIG. **1** the grinding flaps **13** in their completely fixed position to the back plate **11**. According to FIG. **3**, back plate **11** is provided on its outer circumference with a circumferential flange **17**, which is bent over in hook-like manner with respect to the main plane of back plate **11**. This circumferential flange can e.g. be beaded. According to FIG. **3**, the outer circumferential edge of the back plate **11** is bent over by more than 90° in order to form the circumferential flange. The latter gives the back plate **11** an extremely high torsional stiffness, which has a favourable effect on the dimensional stability in operation. The slightly inwardly inverted over edges of the circumferential flange **17** form a circular opening. As the diameter of the circumferential flange **17** increases conically towards the main plane of back plate **11**, the space surrounded by circumferential flange **17** increases from the circumferential edge of said flange to the main plane of back plate **11**. It is therefore possible to fix a circular ring-like supporting plate **18** behind the circumferential edge of the circumferential flange **17**. Such a ring ensures a fixing of the rear flap portions.

The rear region of back plate 11, i.e. the region remote from the grinding flaps 13 is covered by the supporting plate 18. The latter is only purely diagrammatically shown in the left-hand region in FIG. 3. The supporting plate can extend over the entire circular disc surface of the back plate 11, naturally with the exception of the always necessary reception bore. If the supporting plate 18 has a construction and in particular a strength and rigidity corresponding to the corresponding characteristics of back plate 11, an extremely stable and rigid construction is obtained. It is also possible to use supporting plate 18 for bending over and simultaneously fixing the rear ends of the grinding flaps 13.

It is generally sufficient if the supporting plate 18 is firmly connected to the back plate 11 in the outer circumferential region, e.g. by welding, bonding, rivetting or beading. It is also possible to provide additional fixing points on the surface of the two plates, if this should be desired with a view to obtaining greater strength, stability and rigidity.

Both supporting plate 18 and back plate 11 can be made from light metal giving an extremely lightweight and at the same time elastic and very stable construction. This construction of the object of the invention is also largely corrossion-resistant and as a waste product is also very advantageous from the environmental standpoint.

As is diagrammatically shown in FIG. 4, the fixing of the grinding flaps 13 can be further improved in that fingers 14 with stamping points 16 are formed on supporting plate 18. These stamping points 16 can be small protuberances, which are arranged on that side of the fingers 14 facing the grinding flaps 13. If the supporting plate 18 and back plate 11 are compressed for anchoring the grinding flaps, the raised stamping points 16 are embedded in the material of the flaps 13 and consequently form additional anchoring points.

In place of the stamping points 16 illustrated in FIG. 4, e.g. the edges of the fingers 14 could be slightly bent and made sharp-edged in the direction of the grinding flaps 13, so that on pressing together the two disc or wheels the edge regions are embedded into the material of the flaps 13 to such an extent that a reliable anchoring of flaps 13 between back plate 11 and supporting plate 18 is ensured.

The lower region of FIG. 4 illustrates diagrammatically an alternative embodiment of the supporting plate 18. Two barbs 19 are formed on the finger 14 shown at the bottom and on pressing together the back and supporting plates, when the fingers 14 are pressed into the body of the supporting plate 18, their tips are embedded in the material of the grinding flaps 13.

Barbs 19 are produced in such a way that initially an angular slot is made in a finger 14. The region of the finger 14 enclosed by the angular slot is then bent out of the finger plane counter to the direction in which the finger is exhibited opposite to the back plate. A grinding flap 13 can be readily inserted in the slot, without being significantly hindered by the barbs bent out towards the grinding flap. Only when the fingers 14 are firmly pressed onto the grinding flaps 13 do the barbs 19 embed in the material of the flaps and thereby form an extremely reliable fixing of the flaps 13 between back plate 11 and supporting plate 18.

For the easier understanding of FIG. 4, in the example of the upper finger 14, only one grinding flap 13 is indicated in broken line form for illustrating the association of supporting plate 18 and fingers 14 with respect to the grinding flaps. The fingers 14 are bent out of the drawing plane in the direction of the back plate and flaps. They are braced against the grinding flaps 13 and consequently ensure that they cannot be drawn out of the complete grinding wheel.

FIGS. 5, 6 and 7 diagrammatically show an advantageous further development of the grinding flap 13 provided in its rear edge region 20, for insertion in one of the radial slots in the back plate, with a slot-like recess 21 (FIGS. 5 and 6) or with several such recesses 21 (FIG. 7). In the case of a grinding wheel equipped with grinding flaps 13 according to FIG. 5, tongues 16 are placed through the recesses 21 and in this case need not have any stamping or barb. Thus, the grinding flaps 13 are caught by the recesses 21 and prevented from drawing out.

Alternatively, fingers 16 can be longitudinally subdivided into several, not shown finger portions in order to secure the associated grinding flaps 13 in a combination of clamping and back-engaging. Fingers 14 are subdivided into three portions for the use of grinding flaps, e.g. according to FIG. 6. The central finger portion is passed through the recess 21 of the particular grinding flap 13, whilst the two outer finger portions press onto the laterally adjacent flap portions.

FIG. 7 shows in exemplified manner a grinding flap 13 which, apart from the recess 21, has lateral recesses 22, so that projecting flap arms 23 are formed. The end face of the slots provided on the back plate engage in recesses 22. The projecting arms 23 extend over the longitudinal extension of a radial slot in the back plate and by bearing on the latter provide an additional securing effect.

A further alternative of a lamellar end grinding wheel as shown in FIG. 9 comprises arranging a flat, arcuate strip 25 between the back plate and supporting plate and this is passed through the recesses 21 of several juxtaposed grinding flaps 13. FIG. 8 shows a further example of a lamellar end grinding wheel in a purely diagrammatic cross-section along the circumferential line. The rear edge portion 20 of the grinding flaps 13 is provided with a thickened portion which, in the present case is a clip, which substantially extends over the entire width of the grinding flap. This clip can e.g. be fitted by bonding or rivetting to the flap 13. FIG. 8 clearly does not illustrate the final state of the lamellar end grinding wheel when the back plate 11 and supporting plate 18 are firmly interconnected and pressed against one another, leading to the clamping of grinding flap 13. In this state, finger 14 presses against portion 20, the end face of finger 14 being embedded in the material of grinding flap 13.

What is claimed is:

1. Lamellar end grinding wheel comprising

a circular disc-shaped flexible back plate,

grinding flaps arranged along a circumferential zone of said back plate so as to overlap one another in tile-like manner and being fixed there, said grinding flaps being passed through radial slots formed in said circumferential zone, said back plate being constructed as a sheet metal plate,

a supporting plate arranged on the side of said back plate remote from a working surface, said supporting plate being firmly connected to said back plate at least on the outer circumference of said back plate,

rear ends of said grinding flaps being fixed between said back plate and said supporting plate, and

a circumferential edge of said back plate being bent over towards a side remote from said working surface to form a hook-like circumferential flange in radial section and said supporting plate being fixed under said hook-like circumferential flange.

2. Lamellar end grinding wheel according to claim 1, wherein at least one of a side of said back plate and said supporting plate associated with said rear ends of said grinding flaps are provided with projecting stamping points for engaging in said grinding flaps.

3. Lamellar end grinding wheel according to claim 2, wherein said stamping points are constructed as triangular barbs.

4. Lamellar end grinding wheel according to claim 1, wherein said suporting plate has radial fingers, which are arranged in sloping manner in a circumferential direction.

5. Lamellar end grinding wheel according to claim 4, wherein said grinding flaps have at least one slot-like recess in their rear regions which are passed through said radial slots.

6. Lamellar end grinding wheel according to claim 5, wherein said rear region of said grinding flaps is provided with projecting arms, said projecting arms engaging end faces of associated slots and extend over and beyond the longitudinal extension of the associated slot.

7. Lamellar end grinding wheel according to claim 5, wherein a flat, arcuate strip is located between said back plate and said supporting plate and is passed through recesses defined by several juxtaposed grinding flaps.

8. Lamellar end grinding wheel according to claim 1, wherein said supporting plate is made from sheet metal.

9. Lamellar end grinding wheel according to claim 1, wherein each of said rear ends of said grinding flaps is provided with a thickened portion.

10. Lamellar end grinding wheel according to claim 9, wherein said thickened portion comprises a mounted clip extending substantially over the entire width of a particular grinding flap.

11. Lamellar end grinding wheel according to claim 9, wherein said thickened portion is formed by rivets, which are fitted along the rear end of a particular grinding flap.

12. Lamellar end grinding wheel according to claim 9, wherein said thickened portion is formed by an adhesive bead, which is applied to said grinding flaps.

13. Lamellar end grinding wheel comprising

a circular disc-shaped flexible back plate,

grinding flaps arranged along a circumferential zone of said back plate so as to overlap one another in tile-like manner and being fixed there, said grinding flaps being passed through radial slots formed in said circumferential zone,

a supporting plate clamping said grinding flaps on a back side of said back plate, and

a circumferential edge of said back plate bent over towards a side remote from a working surface to form a hook-like circumferential flange in radial section and said supporting plate being fixed under said hook-like circumferential flange.

14. Lamellar end grinding wheel according to claim 13, wherein said supporting plate and said back plate are made from sheet metal.

15. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are welded together.

16. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are connected toward each other by spot welding.

17. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are flanged to each other.

18. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are bonded to each other.

19. Lamellar end grinding wheel according to claim 13, wherein said back plate and said supporting plate are connected to each other by riveting.

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